TELEPHONE ENGINEER

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THE VALUE OF TELEPHONE SERVICE

A recent number of a trade paper carried a story of a legal action brought by a physician against a telephone company, the suit growing out of the omission of the physician's name from the current telephone directory. It seems that the doctor was accustomed to receive some twenty-five calls per day over his telephone when suddenly—as a result, it was claimed, of the omission of his name—this number dropped to nearly nothing. In the course of three months, he calculated that his loss in business amounted to $5,000, and, accordingly, sued the telephone company for damages.

The case still is in litigation, so that a decision as to the liability of the company has not been made, but there is an interesting angle to the case in the figures placed on the value of the telephone service. If the losses alleged actually have been incurred, we have the condition that an agency which costs—even at the highest rates in vogue in the metropolitan centers—only a few dollars per month is responsible for business amounting to $20,000 a year.

This may be an exceptional case, but in the case of nearly every user it can be shown that the value of telephone service is several times its cost. This is a fact that constantly should be kept before the public and it is particularly important that it be done during the preliminary publicity work that precedes an application for increased rates.

SOME THOUGHTS ABOUT THE BELL REPORT

An outstanding feature of the Annual Report of the American Telephone and Telegraph Company for 1924, aside from the statistical and financial statements, is an extended discussion of the continued increase in cost of giving telephone service and the continued increase in the average telephone exchange rate. In some quarters there has been a disposition to criticize reports of the last few years for a certain lack of frankness in this matter, but the critics will find no cause for complaint in the present report.

Everyone who is conversant with telephone matters knows that there has been an increase from year to year since 1914 in the cost per station of giving telephone service. This has gone on steadily, although there has been a decrease in the average living costs since the peak of 1920. It may as well be recognized and admitted that the peak in telephone costs has not yet been reached, even if living costs remain stationary or even decrease somewhat.

The reason that the peak in telephone costs has not been reached is two-fold as is well-pointed out in the Bell report. In the first place telephone rates never have reached the levels of general commodity prices since 1914. A chart in the report shows that the cost of living at the close of 1924 was nearly 75 per cent above the 1914 level, while telephone exchange rates were only about 30 per cent above 1914. Reduced to other terms, there has been an actual decrease in the cost of telephone service in terms of the cost of living. As the report says, the adjustments "may be understood—as adjustments of rates to the present value of the dollar rather than increases in net earnings on property over what has been customary in the past."

The second contributing factor is the increase in demand for telephone service which has required the construction of much additional plant to meet the demand. All this plant has been built at a very much higher cost per station than the pre-war plant and as a result must carry higher capital charges per station. Since 1920 the portion of the cost of telephone service that varies with the cost in plant, has increased about 23 per cent. This increase has more than counterbalanced the decrease in operation expenses so that the net effect has been an increase in cost of service since 1920. As long as the demand for service increases and as long as the cost per station of the additional plant remains at the present levels, the cost of service per station is bound to increase.

In the section on Rate Regulation, the report states the policy of the companies of the Bell system to continue their effort to have their rates adjusted up to the point required by prevailing costs

of material and labor in order that the business may be everywhere self-sustaining. Four of the Associated Companies paid dividends during 1924 partly out of accumulated surplus, but, in the main, the companies earned more than their dividend requirements.

The statistical and financial reports have been well digested by this time, and so little comment is necessary other than to remark that they again awaken admiration for a business that can finance such remarkable growth, can maintain such uniformly satisfactory service and can make a favorable financial showing on an income that has not yet reached the levels of general commodity prices.

THREE QUESTIONS TO PROVE A PROJECT

In an article in "The Bell System Technical Journal," F. L. Rhodes tells a story of Gen. John J. Carty which goes back to the days in which the latter was Chief Engineer of the New York Telephone Co. In those days, whenever an estimate for a specific piece of work was placed before him, it was his custom to ask of himself three questions regarding it: 1. Why do it, at all?; 2. Why do it, now?; 3. Why do it, this way? Rigorous proof of these three questions was required to justify endorsement of the project.

Every executive, upon whom rests the burden of approving estimates or authorizing work to be done, would do well to keep in mind these three questions and to require satisfactory answers to them before allowing work to proceed. If the three questions are answered by sufficient proof, then there is every assurance that the project is amply justified.

TEMPORARY WORK

A frequent cause of much poor service and of uneconomical operation is the evil known as temporary work. Yet a surprisingly large amount of this kind of work is being done every day in the telephone plants of the country. The repairman goes to a telephone on a case of trouble and finds missing from his kit a necessary part which is needed to make the repairs. He uses a substitute temporarily, intending to replace it with the proper part later. A lineman goes up a pole to remove a cross between wires. Being busy he does not take the time to pull slack, but ties one wire away from the other temporarily, intending to come back and pull the slack in a day or so. A line gang is stringing a circuit and finds that additional cross arms are needed. They are hurrying to get the circuit in service and so they hang the wires in loops under existing cross arms, expecting to come back to place the cross arms the next day. The switchboard repairman is hunting a case of trouble on a cord circuit and finds a wire broken at a relay terminal punching. He does not have a hot soldering tool available at the time and as he has several other cases of trouble, he clears them first with the intention of soldering the connection as soon as he is through. The list may be prolonged indefinitely as any telephone man may testify.

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Following the history of these cases, we find that the proper part never takes the place of the substitute until the telephone is again in trouble, the slack is never pulled until after the next or some subsequent cross, the cross arms are never placed unless low insulation or short circuits intervene and the connection is never soldered until the case of trouble repeats. A few moments at the time that the work was done temporarily would have made a permanent job and future difficulty would have been avoided. As one old-timer put it, "the trouble with temporary work is that it is permanent." As soon as the job is left, it is usually treated as a permanent job and nothing further is done until necessity compels. Such work is never economical and is not often necessary.

WHY NOT PUT IN COPPER NOW?

There are hundreds and thousands of miles of iron wire toll line in service in the country in places where copper wire could be used to advantage on account of the superior transmission efficiency. First cost has been a large element in the decision to use iron wire, but just at the present time it would seem that the opportunity has come to substitute copper. Copper prices have been remarkably low for a long period. After a slight rise early in the year they have settled back again. Iron prices, on the other hand, have advanced slightly within recent weeks.

At present price levels, considering the salvage value of copper, it is probable that copper will prove to be cheaper in the long run than iron provided that adequate pole lines are available. Several progressive companies are planning to take advantage of this by putting up copper for toll line purposes to add to existing facilities and to replace iron wire which will be used to relieve heavily loaded rural subscriber lines.

New Angle on Rate Value

This Article Expresses the Author's Ideas on the Propriety of Using Reproduction Cost in Rate Making—Also Offers a Plan for Taking Care of Storm and Fire Disasters

By JAMES W. DAVIS

Telephone operating men have contended for, and commissions have allowed under the law, the basing of rates on present reproduction costs, the plant owner adducing that the material involved in the plant is worth more because of the rise in prices since it was installed in the plant. Still, would any engineer lay out a new plant in the community anywhere near like the present one, which "just grew"?

I wonder what would happen if prices took a sudden tumble and reproduction cost fell below the book value? It is a safe wager, with the sky as the limit, that either the service would suffer or the commission would be asked to allow rates to be raised, to be consistent with the book value. In fact, we have had a demonstration of this very thing, following the recent storm in Illinois.

The champions of rates, based on reproduction cost, where this can be manipulated to exceed book value, were on hand in a jostling crowd, imploring the commissioners for relief through higher rates to eke out the plant which was wiped out by an act of providence. Just what basic difference is there between an economic condition which causes an appreciation of the reproduction cost of the structural elements involved in the plant, and a sudden depreciation of the reproduction cost, resulting in the wiping out or damaging of a part or all of the said elements of the plant by storm, fire, or what not?

Fears Come-Back from Public

If the community should be made to stand for a rise in rates, based upon an appraised reproduction cost (installed materials costing more when assumed to be repurchased) the community should not be made to recoup the operating concern from a loss sustained through storms and the like. Public service operators will receive a severe flareback one of these days because of this contention—perhaps before prices recede below the present level—because some untrammeled engineer who is not obliged to expound venal opinions is liable to expose the deceit through the proper channels. The public will run amuck again, in spite of the diverse security ownership and our public relations missionary endeavors, if it finds out that it has been the victim of a "heads I win; tails you lose" game. And this regardless of the fact that it gets more for its money in the service received from the public service company than in anything else it pays for.

Editor's Note: Here is an article that sets before us something that is worth a measure of consideration. We may not agree with all the writer says, but there is a growing belief in certain quarters that the establishment of reproduction costs as the sole controlling element in rate making would not be without its dangers. We present this article in the belief that it is not always good to look at but one side of any question.

Frankly, I would like to see this brought to an issue by some outlaw engineer, and that with a thousand pounds of steam behind it, because the sooner the buncombe of reproduction costs being the equitable basis for public service rates is exposed, the shorter will be the fall when it comes.

The public always is suspicious of depreciation charges and reserves, as it has a well-founded notion that the amount charged off for depreciation and accordingly reflected in the rates will, to a certain extent, appear in the capital account rather than be applied to discarding obsolete or worn-out plant; even though the depreciation funds may be reinvested in the plant. The public senses that the excess of appraised reproduction cost over book value results to an extent from artful bookkeeping with the depreciation funds.

Why Bock Value Is Preferable

If book values governed, the public would not be so suspicious and therefore would not oppose building up the plant with depreciation funds if the depreciation charge-off were greater than the actual depreciation, nor would it oppose a more open levy on the operating account for obsolescence, simply because it would have assurance that this would not be capitalized against it, as is now done. The public would feel that, even though the plant became more valuable than would be shown by the book value, at least the property was in the service of the public and the public could not be injured by pyramiding accruement to the plant by using the accumulations as a further basis of rate levies.

It is my belief that this policy would bring about a complete change in the attitude of the public towards public service companies and forestall the agitation for public ownership. It would have a strong bearing upon the stability of securities and the ease of marketing them, as well as afford lower interest rates.

Is Our Present Psychology Wrong?

After a subscriber listens to a public service officer or his representative talking in choked accents and contrasts their conjured-up visage of sadness when before the commission with their chuckle after they get the commission's assenting order; or, if the subscriber has been told beforehand by the fiscal agent of the company of its great prosperity—he is inclined to grow suspicious and feel that he and the rest of the public have been hoaxed. After that, he is not even receptive to the truth; so, he can't be blamed if he becomes obdurate. Let public service operators laugh this off.

The public will not object to allowing a public service company to earn a fair business rate on its investment, will even go further and permit the investment to be safeguarded by ample or quite liberal depreciation. The individuals who make up the public do not wear their clothes to the limit of their usefulness in keeping one warm or in maintaining an appearance barely within the sartorial code of civilization; nor do they wear out their autos or their business and factory equipments to the ultimate. Neither do they expect nor want the public service companies to do this. If the telephone or any other public service can be made more adequate, and therefore a more potent agency in the business and social relations of the public, the public in turn will not begrudge assessments for displacement of equipments long before said equipments are completely worn out—if they believe they have not been hoaxed. Yes, Mr. Public Service Operator, this is another statement for you to try to laugh off.

For the Engineer to Think About

Some practical accountant engineers in private practice, and in the employ of the commissions and the government will disagree with foregoing statements. They will think of many specious reasons sup-

porting opposite beliefs. Of course, the phases of issue between the public and the public service companies is their stock in trade, as it were. Why, haven't they worked out this problem of depreciation and obsolescence! To these gentlemen who take issue with me, I want to say that I concede your consummate knowledge of calculus with its weird manipulations; also, your knowledge of mahogany office furniture and steam heat, so that much is disposed of with the honors all yours. But, have you a practical understanding of the equipments and general plant elements; have you a concrete, technical knowledge of the telephone business; and are competent traffic equipment and outside-plant engineering so combined so that you can specify correctly every element of the plant in its ultimate details without asking questions? What do you know about the many issued patents relating to the telephone and electric arts in which you practice, as well as the many pending applications? What do you know of the research work and trend of the art, in view of its present potential state—beyond the bunk that is put out for the reading public from time to time? Try this in your pipe after dinner some evening, and tell me your thoughts; if you really and honestly know very much about depreciation and obsolescence.

When public service operators begin to talk book value as the true basis of rate making, and when they educate the public to the fact that improvements will be made in the measure of the subscriber's willingness to pay for them—no more; no less—the hocus pocus will have been taken out of the public utility business, and a long step, leading to better and more cordial relations between the public and the public service companies, will have been accomplished. This will admit of "letting up" on the pressure of "public relations" and "joining" which, indirectly, is costing subscribers increasingly large sums and is leading public service operating companies too near politics, with its demagogues. No man starts explaining that he is perfectly sober, unless he actually has taken a few drinks. Wad that in your meerschaum, Mr. Utility Operator, and start "pulling."

The public can be counted on as fair, if it does not discern writings on the wall that indicate it is being duped. Roll up your shirt sleeves, gentlemen, and handle all of the cards above the table. It's safer. Don't tell commissions one story, and prospective investor another. You know what happened to the man who confused his enclosures when sending reports to his banker and to the revenue collector. The most progressive members of the public do not want public ownership; but the most supine ones won't care what happens, so long as they get public ownership, if they start running amuck. Turn your ear towards Los Angeles, and listen attentively! Start digging your cyclone cellar.

How to Provide for Disasters

In line with this, it seems to me that a general contingent fund should be raised and placed under state officer control, for investment in public securities of the state and government, to take care of funding any telephone company which experiences storm or other sudden damage above a certain percentage of its book value. This funding should be in the way of a loan covering a term of years and should be paid back into the general fund by increases in the rentals and tolls, if necessary. In other words, the interest and amortization of the loan from the general fund should be considered as an operating charge. This would insure each community against loss of service and would protect investors in the system against loss of capital. This also, automatically, would place an insurance rate on each community in accord with its risk and actual hazard, according to the standard of construction employed in its outside plant, its fire protection, etc.

This contingent fund should be raised by a levy on all the Independent telephone companies and recognized as an operating charge so that it would enter into the rates, directly. This fund should be gradually raised to a certain percentage of the total book values of all the operating companies and thereafter allowed to accrue from its interest payments, if possible. This would impose a small increase on each subscriber in the Independent field of each state—which increased rate would be a measure of the hazard—but it would be an assurance to subscribers that if a storm occurred in this community and laid low the property of the telephone company, the service would be promptly and adequately restored without undue burden on the operating company as regards procuring and maintaining a loan—a loan that necessarily would have to be reflected in the rates, to absorb it. This plan would be more equitable and certain than that of each company trying to set up a reserve for a contingency, the extent of which cannot be anticipated. While the public will pay for an actual damage with more cheer and with less suspicion than for an anticipated damage, the objections to a fund would not be great, because some losses always are arising, but not all in the same place. Hence, a single fund of a general nature will need to be but a fraction of the aggregate of the funds that would have to be independently set up by the many separate, operating companies.

As a matter of fact a general fund would cost the subscribers less than at present, where each company is striving to set up a contingent fund for situations that may never arise. There is no reason why the Independents should be reckoned with solely as Independents. The Bell also could be taken in. The Bell, indeed, has been doing this very thing. The extent of its systems are such that a general depletion of plant is not apt to occur, as is the case with isolated property units of Independents not enjoying a common ownership relation. The proposed plan should not be a matter of privilege or option for an Independent to affiliate; it should be mandatory under the law.

This general fund idea could be carried to the point of actual insurance for a percentage of the storm or other sudden depletion of plant, so that all funds advanced to an operating company would not have to be repaid to the general fund, having in mind that while each community's interests are largely centered there, the service in all communities have a certain mutual aspect that justifies a mutual charge for a sudden loss in any community. While our plan may best be confined to single states at first, it eventually could be made country wide in its operation.

Pennsylvania Meets May 5-7 at Harrisburg

Harrisburg, Pa.—The annual convention of the Pennsylvania State Telephone and Traffic Association will be held in the Penn-Harris Hotel, Harrisburg, Pennsylvania, on Tuesday, Wednesday and Thursday, May 5th, 6th and 7th, 1925.

An advance announcement says:

"To those who attended our convention last year, it is unnecessary to speak of the interest shown in all of our meetings and the subjects which were discussed, and it would be impossible to describe the excellence of the manufacturers' exhibits.

"We anticipate that the change from January to May will enable many to attend who have always been kept at home by annual meetings.

It also assures us of good weather and a chance for outdoor recreation. Harrisburg with its river and surrounding mountains is most beautiful in May and you will enjoy a visit to the Capital City after the work and worry of the winter months.

"All of the manufacturers who exhibited last year will again be on hand and several others have requested space for additional exhibits."

Meredosia, Ill.—Henry J. Roegge and others have incorporated the Lyda Telephone Company.

Substation Installation

Speed and Low Cost of Subscriber Station Installation Require Satisfactory Specification and Efficient Routine for Performance—"Pilot" System Described

By CARL C. BOSE

Supervisor of Station Installation, Indiana Bell Telephone Company

What does this phrase, "Station Installation," mean to the average individual—to the doctor, lawyer, merchant, or anyone requiring this class of public service. Any one of these prospective subscribers, desiring a telephone, will go to the local commercial office of the telephone company and ask to have a "phone" installed. After the class of service is decided upon and all forms filled out, the question is usually asked by the commercial department as to when it will be convenient for the subscriber to have the installation made. Does this prospective subscriber say, "Oh! That doesn't matter. Any time within the next week will do." No! In the majority of cases the subscriber wants the telephone immediately.

A public utility, whether it be a telephone company, water company, gas company, or light and power company, is organized to serve the public. However, to serve the public means not only to give service as quickly and as cheaply as possible, but, after this sservice is given, to have it uninterrupted through trouble. There are many things in a telephone plant which have a direct bearing upon this question, but, as this paper only deals with the subject of station installation, we will confine the discussion to points along this line and consider what "Station Installation" means to a telephone man.

The telephone plant, the central office equipment, the conduit, underground cable, aerial cable and open wire have been placed. There is one more step before the telephone plant is ready for service. Without this last step—station installation—the placing of the telephone—this entire equipment would be useless so far as the transmission of the human voice is concerned.

In order to carry out this function of station installation along the lines of speed, uninterrupted service and costs; that is, first—installation costs, and second—maintenance costs; consideration must be given to ways and means whereby a systematic form of installation may be carried out and uniform, standard equipment used. If the installation forces, whether they be large or small, are all trained to install along the same lines and use the same class of material, not only will the speed of installation be increased, but the class of installation will be better and consequently maintenance costs less upon the completed job.

In order to accomplish this, a standard routine for installation and specifications covering all forms of telephone installation are now being used by the Indiana Bell Telephone Company. Every installer is put through a course in the plant school where all points in station installation are covered. To go into a complete discussion of this routine and the specifications would consume too much time. I will, therefore, endeavor to outline in a general way the main points as covered, and will go into detail on the more common form of station installation.

Sub-Station and Private Branch Exchange Protector Installation.

In this specification is detailed the standard methods used in the mounting of the station protection and auxiliary protection used on P.B.X. trunks, battery feeds and outside stations, the placing of ground wires and ground clamps, and the correct method used in replacing parts of these protectors. The protection of the ground wire against mechanical injury and exposure to foreign currents, examples of which have been placed upon exhibit, are also detailed in this specification.

Sub-Station Apparatus and Sub-Station Apparatus Installation.

Herein is detailed the standard list of station apparatus, where each type is to be used, and the methods of mounting and assembling.

Sub-Station Wiring and Connection.

Due to the various types of construction used in the erection of houses and office buildings, the methods of placing of inside, or station wire presents several problems which are detailed in this specification.

In order to eliminate the tacking of station wire to baseboards and the placing of rings on walls and ceilings, objections to which have been raised by subscribers and building owners, conduit systems are being installed by the owners in office buildings and in some of the better types of houses. The conduit boxes being placed at the exact location where the instrument is to be mounted, the subset can then be installed on a backboard directly over the outlet box, eliminating the necessity of exposing or tacking inside wire to the baseboards. In the course of sub-station installation and wiring it becomes necessary to make installations varying from one party lines to prepay coin collector sub-stations and the placing of key jobs.

The key jobs are separated into what are called plans. The cutoff plan provides keys at designated stations so that these stations may cut off other stations from the central office of P.B.X., providing, in connection, the holding and intercommunicating features.

The pickup plan provides keys at designated stations so that these stations can pick up any of two or three lines and also provides the holding and intercommunicating features.

The secretarial plan provides a key so that a secretary can answer calls on either of two lines, with the holding feature.

Keys are also furnished whereby extension bells may be cut off, receiver equipment may be installed so that a second party can listen in on telephone calls, and auxiliary equipment placed so that subscriber may use either a hand or head receiver.

As the installer does not perform these different types of installations regularly, it is necessary that he be acquainted with his specifications and know exactly where to find the required information. The specifications on substation connections and sub-station wiring plans provide circuit diagrams and show in detail the hookups necessary for every type of installation. In the districts where both manual and automatic sub-stations are located, the installer is furnished with a specification on machine switching sub-stations which shows the various connections necessary in hooking up an automatic or machine switching telephone.

Drop and Block Wiring Specifications.

The specifications as outlined so far deal only with the interior work of station installation. The placing of the drop wire, or block wire, as the situation may demand, is covered in specifications known as drop wiring and block wiring. In order to bring out different

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points of interest in this part of the work, we will go back to where the prospective subscriber has signed the contract. The form upon which the name, address, and class of service is entered is then forwarded to the assignment department. The assignment clerk, upon receipt of said form, places upon it the cable and terminal assignments, telephone number and party telephone number to which it is to be bridged. A necessary function of the assignment department is to see that all party lines are kept loaded; that is, that every line, two-party or four-party, is kept working to capacity. It can readily be seen that if this is done, the cable facilities used will greatly exceed those which are actually needed.

The assignment clerk also places upon this form the type of transmitter and receiver to be used. This information is furnished by the engineering department and placed upon city maps in what is designated as zones, the more efficient type transmitters being used to counteract the transmission losses due to long cable hauls. It is possible through this arrangement for a person living on the outskirts of a town to get as good transmission as the subscriber living close to the central office. The form is then sent to the typist who makes multiple copies and forwards to the traffic chief, wire chief, and assignment and installation departments.

The Pilot System of Performing Field Work.

There are many methods used in performing the field work on station installations, which depend upon the size of the exchange, topographical conditions, and the amount of installation work performed.

The pilot system, as used at Indianapolis, consists of a foreman in charge of a one-ton truck and from three to four men. This truck carries all necessary material, instruments, subscriber's sets, wire, knobs, etc., and is equipped with ladders and special tools. A standard list of truck tools is furnished the foreman, for which he is responsible. Each installer is equipped with a standard kit of tools, a check of which is made once every month to see that all equipment is up to standard.

The foreman, upon receipt of the orders for installation, sorts them into routes. At the first location requiring installation he drops off an installer with the required equipment and order. If there are any installations within walking distance, or if it is possible for this installer to take a street car, several orders are given him and his route designated by the supervisor. The foreman then places his other men, stopping at the various locations where material will be needed. You will note that only one man is used to make the installation. If a second man is needed in order to get out pairs from a distant terminal, or to help string several spans of wire, the foreman performs that function. By the time the foreman has placed the second, third and fourth man, the first man is ready to be moved. This routine continues until all orders are completed. The foreman not only plays the part of the second man on the job, but he must inspect each and every job and instruct the men in any phase of installation work with which they need assistance.

The installer, having received his order and required material, first of all inquires from the subscriber the exact location desired for the telephone. After getting this location, which sometimes requires more time than the entire installation, the location for the contact on the house is decided upon. This contact should be as near the inside location of telephone as is practicable, in order to eliminate the number of contacts necessary upon the house, taking into consideration the location of terminal pole, obstructions, such as trees, foreign wires, barns, etc. A coil of drop wire is then carried to the terminal pole; one end is fastened to the belt of the installer and the other end kept clear of ground. Mounting the pole, the installer places, in cases where a distributing terminal is located on the pole, a galvanized pole bracket. Allowing enough slack to enter terminal, he proceeds to make his dead end tie. This dead end tie is so constructed that by unwrapping the tie wire, an extra length of drop wire (about 18 inches) is available either for splicing the drop together in case of a break, or for lengthening the tail to the terminal to permit of changing cable pairs. The installer then proceeds to test through on the cable pairs assigned, with the wire chief, and make connections in terminal. After this connection is made, the drop wire is carried to the house and contact made. If the angle between the house and the drop is less than 30° a knob is used, but if greater than 30° a house bracket is used. This is done in order to eliminate the possibility of the drop slipping off of the knob, also to avoid single knob from being pulled off house or wall. What is known as a double tie is used to hold the drop wire on the knob at this point. If other contacts are necessary on the house, knobs and slipover feature on the drop wire are used. Where the drop wire changes from a horizontal to a vertical position, the single tie is used to support the drop wire. On the last knob or contact where the drop wire enters the house, the double tie is always used in order to securely fasten the drop wire and prevent slipping. Entrance is made to the house, usually into the basement, by drilling a ¾″ hole through the side of the house or in case of brick veneer or stucco, through the window casing. This hole is drilled so that it will drain outwardly. A porcelain tube is then placed in the hole and the drop wire inserted, enough slack being allowed to carry to the protector mounting on the inside. After mounting the protector, which is located as near the entrance as possible, but in an accessible and clean location, the ground wire is run to the nearest water pipe, or in the absence of a water system, to a ground rod. The drop wire is then connected to the protector terminals, inside wire run from the protector to the instrument, and the instrument placed.

Before calling the wire chief for a test, an inspection is made of the protector to see that the carbons are aligned correctly, fuses placed with slots facing asbestos mat, and all connections tight. The installer then calls the wire chief for a test. After making the routine tests, consisting of continuity test, ringing test and talking test, and on machine switching stations a dial test, leaving directory, and in case of machine switching stations instructions on operating set, the installation is considered complete. After cleaning up and gathering together excess material and tools, the installer is ready for the next job.

Routine Must Depend on Local Conditions.

A public utility must serve the public. It must give service cheaply, quickly and have that service uninterrupted. It can only do this in so far as station installations are concerned, by deciding on a routine adapted to local conditions and performing the work in connection with some standard specifications. By training men to install under one specification and to do their work one, and only one way—according to specifications—not only is the cost known as labor time cut down, but the final product—the completed installation—is of better workmanship, thereby eliminating future maintenance costs. Each and every installer is trained under the specifications outlined. Even if in his daily routine he does not come in contact with some of the work outlined, he will be able to find in the specifications the information desired.

All maintenance men are trained along the line of the same specifications. How much easier it is for a trouble man to go out and clear a case of trouble when he knows exactly how that installation will look and what kind of equipment will be there.

The question as to what "Station Installation" means to the average individual can be answered by one word—"Service"—getting the telephone in and keeping it working. The question as to what "Station Installation" means to a telephone man can also be answered by "Service," but in connection with giving "Service," "Costs" have to be considered

—not only first installation costs, but maintenance costs.

Although routine for performing installations may differ depending upon local conditions; specifications, the placing of every installation along standard lines, and the use of the same class of material for every installation provides a means whereby not only "Service" may be given, but "Costs," the major item in any business organization, may be, not necessarily eliminated, but at least reduced to such a point that "Service" can be given at the lowest rate possible. This is the aim of any public utility—the providing of uninterrupted service at the minimum expense.

Southern Bell Companies Have a Good Year

The annual reports of the Southern Bell Telephone and Telegraph Co. and the Cumberland Telephone and Telegraph Co. show that the telephone business in the southeastern portion of the country has prospered the past year. Operating revenues of the Southern Bell were $18,098,388 and expenses $11,814,223. After caring for rent, interest and taxes, net income amounted to $4,585,707. Dividends at the rate of 8 per cent on the common stock were paid and $985,707 was carried to corporate surplus. The company now has 322,747 stations, an increase of 30,481 for the year. On its payroll are 7,483 employes.

Operating revenues of the Cumberland Co. were $18,696,110 and expense $13,058,500, leaving net income of $2,444,071 after caring for interest, rent, taxes and other deductions. Dividends of $1,749,993 were paid on the common stock and $694,079 was carried to surplus. The gain in stations for this company, including those acquired through the purchase of the Louisville Home Telephone Co. and associated properties, was 75,729, making its total 376,668 stations at the close of the year.

J. Epps Brown, Southern Bell Head, Dies at Atlanta

Atlanta, Ga.—J. Epps Brown, chairman of the board of the Southern Bell Telephone Company died here following an illness of several years' duration, at the age of 58.

For 26 years Mr. Brown has been connected with the Southern Bell interests, being elected president in 1919 and continued in that office until June, 1924, when ill health forced his relief from the presidency. At that time he was elected chairman of the board.

Mr. Brown was a native southerner and one of the most popular and highly esteemed of southern big business executives. He was particularly close to the hearts of his fellow workers with the Southern Bell.

A widow and two sons survive him.

Directory Swindler Operating in Wisconsin

Valders, Wis.—Officers and the directors of the Valders Telephone Co. are looking for a smooth individual who worked a directory swindle upon the company and then vanished.

A man who said he would get out a new directory for the Valders company visited the village, secured the privilege of publishing the new list of patrons for the advertising which he could get for the book and went to work. He visited all of the business men in the village and some in the vicinity close at hand, explaining his proposition. He was careful to ask for copy and to have all checks made out payable to the company itself.

After he had completed his canvass he went to an official of the phone company, asked that the checks be endorsed so he could buy his supplies and proceed with the work. The directories would be forwarded as soon as completed. His request for an endorsement of the check was complied with but no directories have been forthcoming to date.

The checks have all been cashed and no trace can be found of the man who did the soliciting or of the company which he claimed to have represented. The amount collected is said to have been under $500.

Indiana Bell Co. Reduces Its Deficit

A reduction in the corporate deficit of the company is shown in the annual report of the Indiana Bell Telephone Co. The deficit at the end of 1924 was listed as $1,945,755, the company entering the year covered by the report with a deficit of $2,243,791.75.

Operating revenues were listed at $9,612,761.74 and telephone operating expenses, $7,065,540.82. Net revenues from telephone operation were $2,547,220.92. Taxes and uncollectable operating revenue amounted to $927,631.21, leaving an operating income of $1,619,581.71. Non-operating revenue of $139,417.82 made the gross income $1,758,999.53. Items totaling $1,409,156.74 were deducted, leaving a net income of $349,842.79, which was carried to surplus and credited against the deficit.

The report shows the American Telephone and Telegraph Co. owns 99.99 per cent of the capital stock. Indiana Bell Telephone Co. paid to the American Telephone and Telegraph Co. during the year $441,658.87 on contracts for services and the rental of material.

Illinois Bell Has 1,058,964 Telephones

Chicago, Ill.—The annual report of the Illinois Bell Telephone Co. shows that the company had 1,058,964 telephone stations at the close of 1924. More than 700,000 of these stations are connected to the Chicago exchange. In addition to Bell-owned stations, there are 371,158 stations owned by connecting companies in the state.

The balance sheet shows over $162,000,000 invested in fixed capital, while the company has approximately $50,000,000 in bonds and $70,000,000 par value of common stock outstanding. Operating revenues were $55,798,975, expense $41,154,437; net, after caring for taxes, rents, uncollectible accounts and interest, $7,237,695. Dividends amounted to $5,401,752 and other appropriations of net income were $1,788,585, leaving $47,357 to be carried to corporate surplus.

Tri-State Issues Interesting Annual Report

St. Paul, Minn.—Condition of the Tri-State Telephone and Telegraph Co. and its operations during 1924 are presented in an illuminating way by the annual report recently issued by the company. Details of the company's progress are given in type and by chart in a plain and vivid manner.

The gross earnings of the corporation for the year 1924 totaled $4,986,846. The expenses of operation, prior to depreciation, taxes, and interest, aggregated $2,536,531; provision for depreciation took $841,339, and taxes required $356,792; interest payments on the funded debt amounted to $284,945. The usual dividends of 6% on the preferred stock and 8% on the common aggregated $689,336, leaving $277,899 to be added to the accrued surplus.

The revenues derived from the operation of the telephone properties showed an increase of 4% over those of the year 1923. Revenue from other sources was reduced by 10.87%, making the net increase on total income 3.62%.

Including depreciation, but excluding taxes and interest, the cost of operation was increased about one-quarter of one per cent. Taxes paid and accrued shows an increase of 30%, partially due, however, to an adjustment made during the year. Interest charges on the funded debt were practically without change. The net income, after all charges, including interest, was greater than in 1923 by 9.31%.

Earnings in their relation to the property values revealed a ratio of 7.3%.

Hints on Cable Work

Protecting the Lead Sheath—Erecting Aerial Cable—Laying Out Cable—Sag of Cable — Reminders for Cable Repairmen—Making a Wiped Joint — Helps on Cable Splicing

By P. KERR HIGGINS

Suspension of Aerial Cable

In order to protect the lead covering of telephone cables it is necessary that it be supported at a great many points. If this is not done, the covering has a tendency to separate at the points of support because of its weight and low tensile strength. It is therefore the practice to use heavy steel stranded wire commonly known as messenger strand to support the cable throughout its entire length. This messenger strand is fastened to poles or to cable crossarms. Three sizes of messenger are in common use. They are known by their strength in pounds, as follows:

1. Six thousand pounds strand is made up of seven strands of No. 12 B. W. gauge galvanized mild steel wires. It is used for supporting 100 pair No. 22 gauge, or fifty pair of No. 19 gauge cable or smaller. This strand is very flexible and easily handled.

2. Ten thousand pound strand is made up of seven strands of No. 11 B. W. gauge galvanized hard steel wires. It is used for supporting cables up to 200 pair No. 22 gauge or 100 pair No. 19 gauge.

3. Sixteen thousand pound strand is made up of seven strands of No. 9 N. B. S. gauge galvanized hard steel wires. It is used for supporting cables larger than 200 pair.

When not more than two cables will ultimately be needed on the same lead, messenger is attached directly to the pole by means of a messenger clamp and through bolt. If one cable only is expected, a single ended bolt may be used. If two cables are expected double ended bolts should be used. If more than two cables will be required cable arms may be used. These cable arms are usually made of steel and are four and six cable capacity. It is present practice to place the messenger as low as practicable and consistent with obtaining proper clearance. Only in very rare cases should it be necessary to go higher than twenty-five feet. One of the lessons of the recent sleet storm was that all weight should be kept as far down on the pole as possible and the Bell Company seem to be carrying out this practice very extensively at this time. In the eyes of old timers this does not look very well, but it is believed that it will prove both practical and economical. This practice also enables us to use the smallest possible poles and get the greatest possible strength from present pole leads.

Cable should be attached to the pole not less than eight inches from the top and if cable arms are used, not less than thirty inches. This practice permits the use of knobs for distributing purposes. Where only one cable is put up, the messenger is usualy attached from the street side of the pole. Cable should never pass from one side of the pole to the other. In fastening messenger to cable cross arms the groove in the clamp into which the messenger fits should be placed towards the pole, except at turns. This brings the weight of the cable nearer the pole. At turns, the groove in the clamp should be placed so that the pull of the messenger is toward the bolt. Messenger strand is dead ended by wrapping twice around the pole or stub with the end held in place by guy clamps. To keep the strand from gradually sinking into the wood of the pole, strain plates should be used.

TABLE I.

Aerial Cable No. 22 Paper Ins. Leaded.	Weight per ft.	Outside sheath. Diam.
15 pr. No. 22 gauge....	.661	9/16
25 pr. No. 22 gauge....	.861	11/16
50 pr. No. 22 gauge....	1.442	29/32
100 pr. No. 22 gauge....	2.410	17/32
150 pr. No. 22 gauge....	3.086	1 1/2
200 pr. No. 22 gauge....	3.494	1 19/32
300 pr. No. 22 gauge....	5.101	2
400 pr. No. 22 gauge....	6.031	2 7/32
600 pr. No. 22 gauge....	7.976	2 11/32

Cable Hangers

There are two types of cable hangers uncommon in use, the marlin type, which is only used on old construction work and by some of the telegraph companies and the metal type, whose number is legion, now in use on all new work. Every new type has its own advocates, but thus far the writer has continued to use the Locke ring. Other types with which he has been experimenting with good results are made of iron wire of various shapes, some of them quite fantastic. The effort apparently has been to reduce the friction on the lead sheath of the cable and to form a cushion on which the cable might ride easily and without injury.

The only serious objection to the use of marlin hangers is their short life. It is not wisdom to mix metal and marlin hangers together on the same cable. As a general rule the rings are placed and clamped to the messenger before the cable has been pulled through. The cable is then pulled through the rings by pulling in a line of manila rope. It is often found difficult to pull in this manila rope directly and in such a case No. 14 iron wire is used for pulling it in.

TABLE II.

Cable Hangers. Marlin.		
8½"	19 ga. cable	25 pr. 22 ga. cable
10" 25 pr.	19 ga. cable	50 pr. 22 ga. cable
12"	19 ga. cable	75 pr. 22 ga. cable
13" 50 pr.	19 ga. cable	100 pr. 22 ga. cable
14"	19 ga. cable	150 pr. 22 ga. cable
15" 75 pr.	19 ga. cable	200 pr. 22 ga. cable
16" 100 pr.	19 ga. cable	300 pr. 22 ga. cable
18" 200 pr.	19 ga. cable	400 pr. 22 ga. cable

From W. E. Co.

When cable is pulled directly through the rings it must be well greased with axle grease.

Erecting Aerial Cable

New cable as a general rule can be pulled in in as long lengths as are furnished by the manufacturer, except where there are a number of turns or angles in the line. For cable that is to be re-erected shorter lengths will generally be advisable. If for any reason a cable should be cut at any time for any purpose, it should be sealed at once with solder to avoid the possibility of the entrance of moisture, unless the cable is to be spliced that same day and the weather is extremely favorable. Even in this case it must be taped up carefully, but not soldered. When cables are strung on very steep grades so that there is danger of the cable slipping on the messenger, the cable should be clamped to the messenger by a special clamp or wrapped securely with marlin. The special clamp or binding should be placed one foot from the pole on the down grade side of at least every fifth pole.

Slack should be left in main cables at points into which branches are to be spliced, except when the number of pairs in the branch cable is less than one-half the number of pairs in the main cable.

In this case no slack is necessary, as the pairs can be "needled" out. When the number of pairs in the branch is equal to or greater than one-half the pairs in the main cable, not less than twenty inches and not more than twenty-four inches should be left in the main cable. The slack should always be left so that the splice can be made on the office side of the pole. When the cable turn is made on the pole, five feet of

slack should be left and when made on the messenger, three and a half feet.

In pulling lead covered cable into position on the messenger, it is often stretched so that the conductors are pulled very tightly together. This increases the electro static capacity of the cable and also makes the cable difficult to repair as it is hard to reach the inside pairs and properly boil them out. It also frequently causes crosses between the conductors, and by reducing the insulation resistance makes the cable more susceptible to damage by lightning or high tension crosses.

The expansion and contraction of cable is greater than that of the messenger strand, hence when bends or pole dips are left in the cable, the continued expansion and contraction of the cable will eventually cause a crystalline fracture to appear on the inside of the bend. This trouble is more likely to occur when the cable is tied tightly to the strand. When the strand is stretched very tightly the contraction and expansion of the messenger will be taken up by the elasticity of the messenger and its length will not be changed appreciably. The movement of the cable at the bend will, however, be increased.

Laying Out Cable

When it becomes necessary to carry a number of cables on one lead, it should be remembered that two cables of a given size are heavier than one cable of twice the capacity in one sheath and moreover requires a separate messenger, thus increasing the dead weight to be carried and the strain on anchorage, guys, etc. Therefore, if two two hundred pair cables are needed, carry one four hundred. If two one hundred cables are needed, carry two hundred. If two fifty pair cables are needed, carry one hundred, and so on for any combination of cables running parallel on the same lead. Unless some peculiar condition makes it absolutely necessary, cables should always feed off in such shape that they will not cross over or under other cable. Hence cable that is to feed to the right should be carried on the right hand side of the lead if possible and cable that is to feed to the left should be carried on the left hand side of the lead. Cables that go straight through should take the middle position if possible.

Hanging Cables by Use of Rollers

The cable reel should be placed approximately one span or pole section from the beginning of the run. It is well here to note that cable reels should never be allowed to remain on the side as it makes it more difficult to unroll the cable when the work has begun. A temporary leading up guy is then placed in position and equipped with cable rollers. The drag line should be brought through all the rollers from the distant end of the run and attached to the cable by means of universal cable clip if available. The cable is then pulled through by means of a team or capstan. After the cable has been run out, one end should be made fast, a pair of heavy blocks with a luff attached to the other end and all the slack pulled out before snubbing. This is important.

Snubbing Cables

Cable is snubbed by using two strands of No. 10 or its equivalent of No. 14 iron wire laced on the cable and attached to the pole or fixture at the end. If the cable stops in the span, the attachment should be made to a messenger by means of a two bolt clamp. Great care should be taken to avoid crimping the sheath or choking the cable. Snubbing with pieces of rope put on with half hitches is very bad practice and injurious.

Tieing Cable to Messenger

All cable rings or clips should be uniformly spaced and crimped or securely fastened to the messenger. The spacing is twelve to twenty inches apart, depending on the size of the cables. Cable rings vary in size according to the diameter of the cable to be erected.

Protecting Cables

Great care should be taken to protect cables in every possible way against damage of every kind, especially against fire. They should also be protected at their outer ends by the installation of protected cans equipped with suitable open space and fuse protection where they are subject to exposure to lightning or high tension crosses. Where no exposure is possible, the non protected terminal may be used.

Several things have to be protected at the end of the cable, including the switchboard, the underground cable, and the aerial cable. In order to accomplish this objective, there is usually provided, first, heat coils at the main distributing frame in conjunction with carbon blocks or open space cutouts; second, seven ampere fuses at the outer end of the u. g. cable; third, open space cutouts equipped with copper blocks or carbon blocks at terminals serving long circuits. A low resistance path to ground to protect the switchboard against currents which would damage it, is provided at the main frame by heat coils which ground the lines for currents of low intensity (sneak currents) and by open space cutouts equipped with carbon blocks and micas .005" in thickness which ground the lines for potentials of over 350 volts.

In order to prevent damage caused by undue heating of the protector or mountings on the main frame a seven ampere fuse is provided in many cases. Recent experience shows that there is little or no economy in the use of fuses to protect against current due to lightning charges. Some engineers advocate the installation of a good ground connected to the messenger at or near the center of each cable section. Otherwise metal hangers are depended upon to furnish contact between the sheath and messenger. However, to be absolutely sure, it is well to bond the sheath and messenger together at one or more points. This will usually prevent burns under the hanger.

Pointers on Terminals

All carbon and fuse protection should be removed from terminals before being placed in position. All terminals should start to read from top left hand corner and read downward. All terminals should be placed on side of pole with lateral. On cable runs place on side of pole with splice. It is considered to be the best practice to place the terminal under the cable although many engineeers are still ordering them placed on top. As a general rule all terminals (except where a pothead is used) should be spliced, tested and tagged before being placed on the fixture. The writer usually carries the cable into the end can instead of using a tail, thus avoiding an additional splice. Terminals should be numbered on the outside, showing the letter of the cable and the number of the box, as A-1. On the inside the cut-out should be shown as 1-25. All lateral and terminal cables should be fastened to the pole by lead strap every two feet. All inside terminals should be at least six feet from the floor and have the cable and wire enter from the top. Multiple the extra pair in the cables into each terminal, wrap in small coil, tag, number and clip the ends clear.

Sag of Cable

In spans of one hundred feet or under messenger should not have more than one and a half inches of sag for cable having from one hundred to four hundred pairs. Table 3 giving the supporting capacity of galvanized strand may be found useful.

TABLE III.

Supporting Capacity of Galvanized Strand.

Ordinary.—Spans in Feet.

Diameter of Strands 32nds of an inch.	100	110	120	125	130	140	150	175	200
Weights of 1,000 feet of cable—pounds.									
16	2818	2516	2263	2152	2050	1867	1709	1391	1154
15	2520	2247	2020	1920	1827	1663	1520	1234	1130
14	2030	1812	1630	1550	1476	1344	1230	1001	900
12	1580	1409	1266	1204	1146	1043	953	774	640
10	1110	899	890	846	805	733	670	544	450
9	860	765	680	652	620	563	513	414	340
8	585	521	468	445	423	385	352	285	235
7	433	385	346	329	313	284	260	210	172
6	337	300	270	257	245	223	204	165	137

Special.—Spans in Feet.

Diameter of Strands 32nds of an inch.	100	110	120	125	130	140	150	175	200
Weights of 1,000 feet of cable—pounds.									
16	6156	5482	5036	4814	4510	4244	3928	3282	2818
15	5520	4974	4520	4320	4134	3808	3520	2948	2520
14	4430	3994	3630	3470	3322	3058	2830	2372	2030
12	3460	3118	2832	2708	2592	2386	2206	1848	1580
10	2430	2008	1990	1902	1820	1676	1550	1298	1110
9	1900	1710	1540	1484	1420	1306	1206	1008	860
8	1285	1157	1051	1005	961	885	819	685	585
7	953	857	778	745	712	655	607	507	473
6	737	663	603	577	553	509	472	393	337

Dip .01 of span.
Factor of safety of two.

Hints and Helps on Splicing Cable

Special material and special tools are necessary to do the work of splicing cable. The following is a list of tools which are necessary or convenient for regular cable work:

One tool box with padlock and key.
Canvas tool bag.
One 3' x 5' platform.
Four platform straps (1¾" x 7' long, holes punched two inches apart from the end five feet back, equipped with heavy rolled snaps).
One 7' x 7' Palmetto tent.
10 oz. D. F. duck.
One tent pole ¾" iron pipe, two 3¼' sections.
70" 7/8' manila rope (two guy lines).
75" 5/8' Sisal rope (one hand line).
Two heavy roller snaps for guy lines.
One iron awning pulley—two-inch wheel. (5/8" rope, hook in one end).
One No. 10 fire pot.
One special hood, 14" in diameter.
One No. 31 torch.
One cable saw twelve inch mitre.
One chipping knife.
One claw hammer.
One 8" metal pot.
One 3" ladle, double lip.
One paraffin pot, 12" x 6", enameled ware.
One dipper, 4⅛" x 2¼" enameled ware.
One drip pan 10" x 14" (heavy black iron bread pan).
Two shave hooks.
One lead dresser.
One soldering iron (weight one pound).
One 1 gal. galvanized oil can.
Two operators' sets, complete.
Two head receivers with cords.
One set dies letters.
One set dies 0 to 9.
Two pieces oilcloth about one square yard each.
One S shaped pot hook 14 inches long.
One special tone test set with trouble finder.
Two combination tag and cut over boards 400 pair.
Socket wrenches.
Two sets paper tags.
One small mirror.

The following special tools are frequently required:

Compound kettles.
Drip pans.
Manhole railing or guards.
Red lanterns.
Paint brushes—stencil daubers.
Plumbers grease can.
Tallow candles.
Manhole pump and hose.
Cable man's cart. (No. 2 Studebaker push carts).

The following material is needed for splicing cables:

Paper sleeves to suit gauge of cable to be worked on.
Paraffin in cakes.
Muslin in three inch strips 10 feet long rolled, like surgical bandages.
Wiping solder. (Dutch boy, half and half, recommended.)
Six balls marlin twine.
Beeswax.
Lockstitch.
One large roll gum paper.
One gallon demijohn of gasoline.
One roll friction tape.
Tallow candles.
Assortment of lead sleeves.

A Few Reminders for Cable Repair Men

Always give a splice two boilings out with paraffin, one before applying the bandage and one afterwards.

Keep all cable splicing material thoroughly dry.

Paper sleeves and muslin should be in a dry receptacle.

Never keep a cable open longer than necessary and never leave a splice with any trouble in it.

It is easier to keep out moisture than to remove it.

Always test hot paraffin or compound with a piece of rubber covered wire and never use paraffin or compound if it is hot enough to injure the insulation.

Never use a split sleeve unless it is absolutely necessary.

Never bandage a splice too tight as it is liable to crush the paper sleeve.

See that lead sleeve is perfectly dry on the inside before slipping into position for wiping.

Proper Temperature for Paraffin

The proper temperature of paraffin for boiling out is 212° F. As a thermometer is not always convenient to test the temperature, the following method is used. When the paraffin is melted and they think it is about the proper heat, the refined cable man puts a few drops of water into the pot (all others "spit") and if the temperature is proper, the paraffin will immediately start bubbling in order to expel the moisture. A little experience will soon teach any one to know the proper jump of the bubble in order to determine the right temperature of the paraffin. If the paraffin is too hot it will catch fire when the water strikes it so that one must be careful to have a cover ready to protect the cable man when making this experiment.

Making a Wiped Joint

The question is frequently asked how to make a wiped joint, and the logical answer is that it is impossible to describe as one must see another make it. Probably the following information will be useful to such inquiries, always remembering that practice makes perfection. The sleeve should be from three to four inches longer than the cut and from 1½" to 1¾" greater in diameter than the cable. The ends of the sleeve should be dressed down until they fit snugly to the cable sheath. Scrape the ends of the sleeve and the cable sheath clean and bright, then rub the surface with a pure tallow candle. This protects and acts as a flux in wiping. Place a cable paster (gum paper) on the sheath one inch from the sleeve and one on the sleeve a half inch from where the paper begins. The distance varies on the larger cables, so the cable man must use his own judgment. The object of the gummed paper is to prevent the solder from adhering to the space beyond the joint and after the wiping is finished this paper is removed or scraped off.

The hot solder is now carefully poured from the ladle over the prepared joint, the overflow being caught in a tallow covered wiping cloth (made of bed-ticking) which is held under the joint with the left hand. The hot solder should be ladled back and forth over the cable so as to get the cable sheath thoroughly tinned and hot enough to wipe without melting through the sheath. The wiping cloth should retain just enough solder to furnish the heat necessary for wiping the lower side of the joint.

As soon as the solder and the lead sheath mix together, the pouring should cease and the moulding or wiping begin, forming the lead into neat curves and wiping the edges where the solder and sheath meet smooth. Care should be taken in handling and examining joints for possible breaks, cracks or blow holes and no movement of the joint should be allowed while it is cooling. The popular composition for wiping solder for ordinary use should be about forty per cent tin, sixty per cent lead by weight. A good test as to proper heating may be made by thrusting a folded piece of dry paper into the molten mass. If immediate withdrawal ignites the paper the heat is right.

Splicing the Cable

When the cables are in position and ready for splicing, the ends should be marked at the point to which the lead is to be removed and scored or cut entirely around. This may be accomplished by a plumber's chipping knife and hammer marking the lead, but being careful not to cut entirely through to the insulation. The cable is then slightly bent when the lead will break around the scored point and can usually be pulled off the cable, or it may then be cut lengthwise from the circle or score to the end by a chipping knife and remove with a pair of pliers. Great care should be used not to injure the insulation. The knife should be held at such an angle as to pass between the lead and the insulation, but not cut the insulation. When the lead

has been removed the parts where it has been scored should be examined carefully and all rough or sharp edges removed. It is also well to flare out or bell the lead sheath slightly with the handle of the pliers or some other blunt instrument.

When the lead covers of the two sections of cable have been prepared, the lead sleeve is slipped over the most convenient end and pushed back along the cable so as to be out of the way. This lead sleeve should be at least as thick as the sheathing of the cable. Before slipping the sleeve on the cable each end of the sleeve is thoroughly scraped with a shave hook for a length of about two inches and the cleaned portion thoroughly covered with tallow candle. This avoids the accumulation of lead salts. The internal diameter of the sleeve should exceed the external diameter of the cable sheath by from one inch to one and a half inch to allow for splicing and paper sleeve. After the conductors have been properly spliced, carefully staggering the joints so that they cannot cross with each other, the lead sleeve is brought into position so as to extend equally over the lead on each cable end. The work is then carried on as indicated in making a wiped joint.

The actual splicing of the wires is done about as follows: First, the core should be tightly bound with strips of muslin or its approved equivalent at the end of the cable sheath, packing the binding close to the sheath so as to prevent any possible injury to the wires or insulation. The whole exposure should then be thoroughly boiled out with hot paraffin until all traces of moisture are removed. The binding also must be thoroughly saturated with hot paraffin. Always work away from the cable sheath toward the ends of the conductors or the middle of the splice. This will prevent moisture being driven in under the lead sheath.

The lead sleeve is next slipped over the end of one cable as already stated and the two cables placed firmly in position for splicing, in the same straight line with the distance between the ends of the sheaths about three inches less than the length of the lead sleeve. After the cables are in position the conductors should be bent out of the way at the sheath and then spliced as follows: Starting at the center of the lower back side of the cable, a pair of wires is selected from each cable. These pairs are loosely brought together with a partial twist thus marking at the bend in the pairs the point at which the joint is to be made as shown in Fig. 1A. Slip on a paper sleeve over each wire of one pair and push the sleeve back far enough to allow room for making the joint, Fig. 1B. The wires are now to

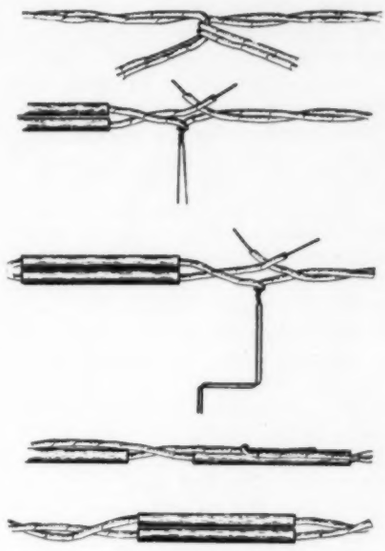


Fig. 1. From top to bottom, A to D.

be connected by a splicer's ordinary twist joint, Fig. 1C. The ends shall be cut off so as to leave the twist of bare wire not less than one inch in length. The twist shall be bent down along the insulated wire and the paper sleeve slipped over the joint, Fig. 1A. The completed joint is shown in Fig. 1E.

In splicing conductors of unequal sizes the wires may be spliced by means of a Western Union Telegraph joint, and soldered if necessary. Soldering joints in cable is the exception and not the rule as the risk is too great. In splicing large gauge conductors the twisted wire should be cut at right angles to avoid any sharp points which might pierce the sleeve. In toll cables the wires are sometimes joined by soldering into a split single tube sleeve. Always splice the center and lower pairs first, forming the outer pairs about the center pairs so that the finished splice may be uniform in shape. In picking out the pairs to be spliced together, care should be taken to transpose the circuit thoroughly. It is sufficient if transposing is done between pairs in the corresponding layers of the two cables. The wire joints should be distributed along the whole length of the splice to keep the size of the splice as small as possible. When all the wire joints have been made the splice should receive two good boilings out with hot paraffin until all traces of moisture have been removed. The splice should then be wrapped with strips of muslin and gently compressed until the lead sleeve will just slip over the splice. Care must be taken not to compress the splice too tightly. The lead sleeve should then be slipped into place until the splice has had time to cool.

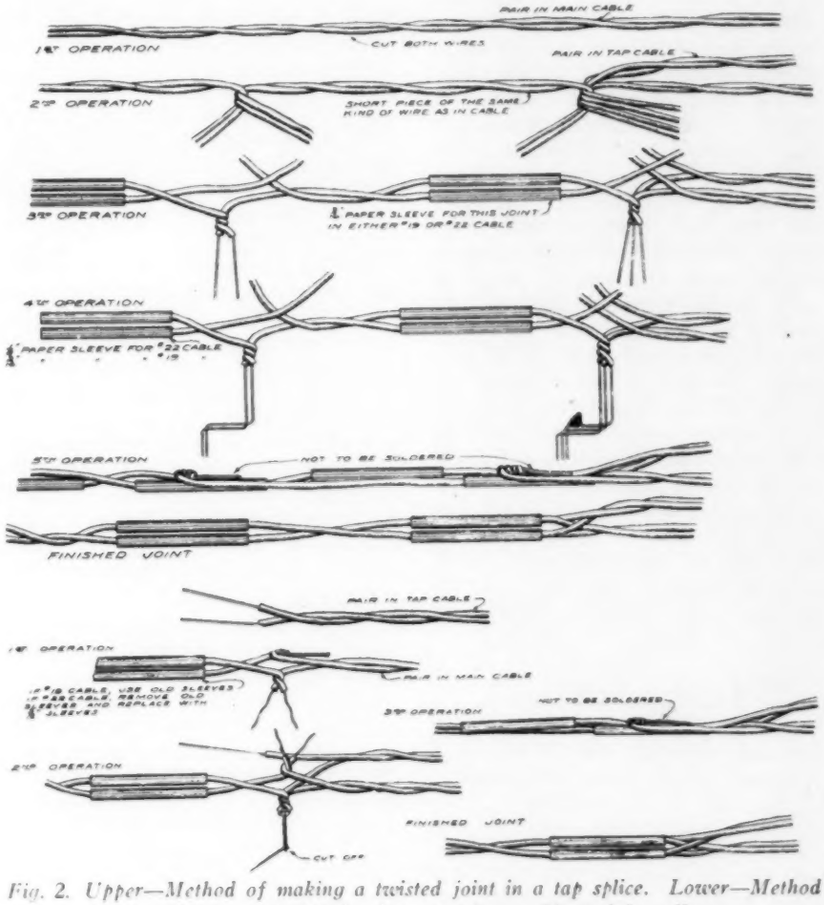

PAIR IN MAIN CABLE
1ST OPERATION
CUT BOTH WIRES
PAIR IN TAP CABLE
2ND OPERATION
SHORT PIECE OF THE SAME KIND OF WIRE AS IN CABLE
3RD OPERATION
PAPER SLEEVE FOR THIS JOINT IN EITHER #19 OR #22 CABLE
4TH OPERATION
PAPER SLEEVE FOR #22 CABLE
#19
5TH OPERATION
NOT TO BE SOLDERED
FINISHED JOINT
PAIR IN TAP CABLE
1ST OPERATION
PAIR IN MAIN CABLE
IF #19 CABLE, USE OLD SLEEVES IF #22 CABLE, REMOVE OLD SLEEVES AND REPLACE WITH #19 SLEEVES
NOT TO BE SOLDERED
3RD OPERATION
2ND OPERATION
FINISHED JOINT
CUT OFF

Fig. 2. Upper—Method of making a twisted joint in a tap splice. Lower—Method of making a twisted joint for a tap in an old straight splice.

In making a three way or "Y" splice two conditions are met. First, where the cables all end at the splice; second, where a branch cable is to be placed into a continuous cable. In the first case the method is generally similar to a straight splice. The sheaths of all three cables are removed for a length equal to the length of the lead sleeve. The two cables forming the main cable are secured in a straight line with the distance between the ends of the sheaths about three inches less than the length of the sleeve. The branch cable should be lashed beside one of the main cables with the end of its sheath opposite the end of the sheath of the main cable. The joint should be made by twisting together like wires of pairs from each of the three cables, taking care to include two or three twists of the insulation in the joint in the manner described for straight splicing. The lead sleeve in this case may be a whole sleeve. It should be slipped on and pushed back on that portion of the main cable away from the branch.

In the second case a split sleeve must be used unless a sleeve has previously been slipped over the cable. The sheath of the main cable should be removed for the length of about three inches less than the length of the sleeve. The sheath should be removed from the end of the branch cable for an equal distance. The branch cable should be lashed to the main cable with the end of the sheath opposite the end of the sheath of the cable. A pair of conductors in the main cable is cut. To the ends of each conductor should be spliced a short piece of core wire of the same size and type as the cable conductor. The second end of the main conductor, the free end of the shore piece of core wire and a like conductor of a pair in the branch cable should be twisted together. This practice of splicing is only used when there is not enough slack in the main cable. The process will be made clear by study of Fig. 2. In putting on a split sleeve a seam must be carefully soldered, then the ends beaten down to conform to the sheaths of the cables and soldered with wiped joints at each end. Care should be taken to retouch the ends of the seam after the wiping is complete in order to make sure that the seam was not open while the wiping was in progress.

Texans Jubilant

Annual Convention Shows Steady, Firm Progress Made By Independents.

Fort Worth, Tex.—For the twentieth time the Texas Independent Telephone Association held its annual convention and presented as evidence of the substantial and progressive character of its member companies some interesting details of the telephone situation in the state and of the service given members by the association.

Not the least of these services is the financial aid which has been widely discussed as the "Texas plan." In the presidential address of R. B. Still it was stated that more than $100,000 has been loaned to the smaller companies under this plan and loans amounting to more than $20,000 are about ready to close. Thus far, operation has strongly endorsed the plan.

The entire executive slate was re-elected.

In telling of the status of the Texas Independent, Mr. Still said:

"In 1907 the federal census of the telephone industry gave us 108,832 subscribers, and the Bell company, 80,030—Independents, 57.6 per cent; Bell, 42.4 per cent. In 1922, 15 years later, the census gave us 249,312 subscribers, and the Bell, 213,112—Independents, 53.9 per cent; Bell, 46.1 per cent.

"From these figures you will readily see that we have no cause for alarm, as to our failure to hold our own in development; this in the face of the fact that the Bell company operates all of the larger city exchanges and many of those of medium size, and that the growth of the cities has far exceeded that of the small cities and towns."

Mention was made of the successful work of the expert volunteer advisory staff of the association and of the fact that in 1924, for the first time in 20 years, there was no bill inimical to utility interests introduced in the Texas legislature.

Further evidence of the good standing the Texas companies have with their legislative and administrative bodies was given in the address made by Judge G. N. Harrison of Brownwood, on "Potential Regulation of the Telephone Utility." A graphic address picturing the stagnation of commercial and social relations of today were all telephones removed was made by Lon A. Smith of the Texas Railroad Commission, in speaking on "The Telephone, a Potent Factor in Present Day Activities."

Harry N. Faris, southwestern district manager for the Kellogg Switchboard and Supply Company, impressed upon the convention the value of proper plant plans, showing how a bad start made in the early days of many telephone plants still is proving a handicap to most efficient operation. Avoidance of patchwork replacements, the economy of fundamental plans made "in time of peace," and the details of planning, were covered in the address made by this acknowledged authority. Mr. Faris laid down as a plan policy for the man in the smaller town, "getting all possible information and then using one's best judgment and common sense." In clinching the case for planning and working in the manner he outlined, Mr. Faris said:

"Although the science of architecture is perhaps 100 times as old as that of telephony, no one undertakes the erection of a new building—or even the extensive remodeling of an old one—without the planning and supervisory services of a competent architect. As the telephone managements of the smaller exchanges come to realize the need of a competent "telephone architect" for plans and supervision of their important undertakings, their service will improve in quality, their regular help will become more efficient, their maintenance costs will go down and their profits will go up."

Of this same sound and helpful character were the other papers on the program, among them being the accounting and engineering addresses made by F. W. Greber on "Methods of Handling Construction and Reconstruction," "The Necessity of Plant Accounting," by E. V. Lineberry, general plant accountant for the Texas Southwestern Bell, L. S. Gardner on "Telephone Accounting," and "Plant Accounting," by J. H. McKee of Brownwood, all of which were features of the lively accounting conferences.

L. W. Howell of Dallas, the Southwestern's general plant superintendent, spoke on the co-operation between Bell and Independents on toll transmission and maintenance.

A highly successful operators' conference which brought into the picture a number of the executives of Texas telephone companies, also was a feature of the meeting.

At the Jubilee luncheon, over which E. C. Blomeyer presided, John Y. Rust made the principal address, one of a reminiscent nature. Blomeyer in pretending to broadcast his remarks, raised the blood pressure of many of the prominent Texans present who were mentioned in his talk.

A resolution unanimously adopted at the closing session expressed regret at what was termed the Bell violation of the commitment made at the U. S. Independent 1922 convention, saying the violation was destroying the confidence of the Texas association in the Bell company keeping to its commitment and imperiling the Independent structure in Texas. The resolution called for obtaining from the Bell a statement regarding its policy in Texas and from the U. S. Independent Association information regarding any matters concerning Bell acquisition.

Making the Cable Layout

Some Hints to Assist the Plant Man in a Moderate Sized Exchange in Laying Out Cable—Determination of Number of Pairs — Illustrations Taken from Actual Conditions

By R. V. ACHATZ

In the average exchange of small or moderate size, the plans for cable extensions are usually made by the manager or by the plant superintendent or construction foreman. There is ample evidence of the good judgment of these men in the many excellent cable plants that are found in the exchanges of the state. Of course, mistakes have been made, the most frequent of which is probably the mistake of making the cables of too small a size so that proper provision for growth have not been made. In the exchange to which reference will be made for illustrative material throughout this paper, a 100 pair cable was placed about 1909 to serve a certain section of town. By 1921 relief was needed. It was estimated that 25 additional pairs would be needed with an outside estimate of 50 pairs. In order to provide liberally, a 75 pair cable was erected. Today the 175 pairs are working at 90% of their capacity.

It must not be understood that the fact that the cables are filled in 5 years is necessarily an example of bad engineering. In fact, it is likely to be an indication of good engineering for it is seldom economical to plan feeder cables for the ultimate requirements. On the other hand, it is bad engineering if such a condition occurs in the case of distributing cables which are placed to distribute the lines to certain blocks or groups of blocks.

Where mistakes have been made and the cable plant is later found to be inadequate, the difficulty frequently lies in the fact that no systematic study of requirements was made but the cable sizes were determined more or less by guess. It is the purpose of the present paper to discuss the problem of cable planning, largely from the viewpoint of the determination of the proper size of cable to be installed. Some additional notes will be given on the gauge of wire required for various locations and distances.

When Cable Should Be Planned.

One of the first questions to be answered in a study of cable planning is the question of when cable plans should be made. In the case cited, where 90% of the conductors of a cable are in use, it is obvious that relief plans are needed. Probably the plans should have been made earlier if the growth is so rapid as was indicated. If 75 pairs were required for the growth in four years, the growth is at the rate of about 20 pairs per year and there is now less than one year's growth available in spare facilities. Actually, there are several sections of this cable in which no spare pairs are available.

Local conditions will control, to a certain extent, the time at which relief should be planned. Among the factors are rate of growth, time required to prepare plans and secure material, availability of funds for the work, etc. As a general rule, it may be said that plans for extension and relief of cable should be made when existing cables reach 80% of their capacity.

Another phase of the cable extension problem is the question of when cable should be extended to replace other types of construction. Cable is usually more economical than heavy open wire leads or large numbers of twisted pair wires. Here again, however, the exact point when cable should be planned to replace other types of construction must be determined largely by local conditions. As Mr. J. N. Kirk pointed out in his excellent address at the Purdue Plant Conference last year, the savings of cable over open wire are frequently more apparent than real in smaller plants. Only when a real saving can be shown should cable be used in the small exchange.

Territory to Be Covered in a Single Estimate.

No definite rules can be given as to the amount of territory that should be served with cable of a given size or cable branching from a main cable at a given point. These factors depend too much upon local conditions. Some of these factors may be illustrated by reference to a specific instance.

In Fig. 1 is shown an area of several city blocks. Walnut street to the left is one of the main thoroughfares of the town and the principal feeder cable is located in the alley east of this street as shown by the dashed line. A branch cable on Center street furnishes the cable facilities for this section, with open wire lines feeding through the alleys for distribution. The section of town is rather an old one in which no new houses have been built for quite a long period. The telephone distribution was laid out about 20 years ago on quite a liberal scale and outside of adding wire as necessary and keeping the lines in a pretty fair state of repair, little has been done.

The entire section is one of those that are easily overlooked. Growth was slow.

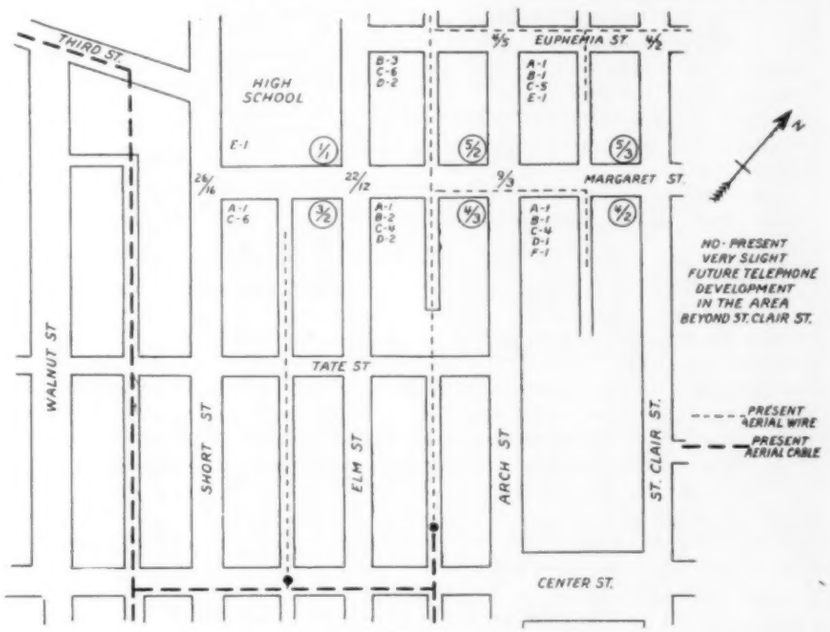


Fig. 1.

**Paper before Telephone Plant Conference, Purdue University.*

A telephone was added here and there but there was no remarkable activity and as a result little was thought of the possibility of additional facilities being required. Attention was finally drawn to the area by an order for a telephone in a house that could not be reached from existing pole lines. Some rearrangement of lines made it possible to make the installation. In a few days another contract in the block immediately east of the high school came in and it was found that no vacancies existed on any of the lines in the vicinity. Likewise it was found that no spare pairs were available at the cable terminal as the entire section of the cable was filled. An individual line contract followed within a few days and so two orders were being held for lack of facilities.

Obviously there was need for action and an immediate survey was made in order to determine how service could be given. Here was a case where both the determination of the area to be covered by the new facilities had to be determined and the sizes of the distributing cables had to be determined.

It is apparent that the congestion in the territory east of the high school can not be relieved by extension of existing cables because the existing cables are themselves congested. Any relief plan must provide for additional facilities as far back as the main feeder cable. As Mr. Goss pointed out last year relief may be provided either by reinforcing the existing cables or by placing cable on an alternate route. Both plans must be studied before a definite decision can be made.

The natural route for relief by the alternate route plan would be the street two squares north of the existing cable but the map shows that this route is cut off by the fact that the street does not extend through to the alley in which the feeder cable is located. To adopt this route would require the obtaining of right of way over private property. Partly offsetting this disadvantage, however, is the fact that some existing line is on private right of way and this could be abandoned if the alternate route is selected.

Consider Future Development.

Another factor that must be weighed before deciding upon the method of obtaining relief is the future development of the plant. In this particular plant a development study had been completed recently and this information was available. It is not the purpose of this paper to discuss the development study of the methods of making it but a slight digression here may be of help in following the discussion of the cable relief plan.

The particular city is an industrial community of about 5,000 inhabitants included in the city proper, an adjoining incorporated town and two villages, all of which form one area from a telephonic standpoint. The city proper is an old community which developed earlier than most Indiana towns and then struck a period of standstill, extending into the second decade of the present century. River and creek, hill and low land, combine to give it a conformation quite different from the rectangular cities of the level land. The general characteristics are shown in the map, Fig. 2. The present wire center is found to be about two blocks north and one block east of the present central office location and the ultimate wire center is approximately 2,000 feet to the north and somewhat to the west of the present wire center. It happens that the ultimate wire center is in a section of low land which is unsuitable for the location of a central office and

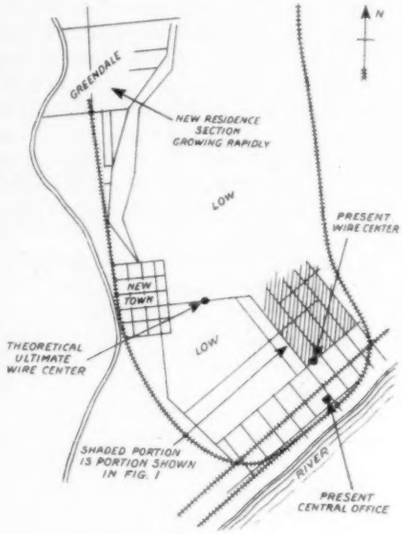


Fig. 2.

the ultimate center will never be utilized as a general office location. In all possibility the location of a new central office will be to the west of the ultimate wire center, at the edge of what is known as the Newton business district. This is a desirable location and is above all known flood levels which sometimes affect the lower ground.

Returning to our cable plan, it may be pointed out that the present wire center is located on Center street, just at the point where the present cable branches from the feeder cable. In the course of the twenty years it will move north and west to a point beyond the limits of the section shown on the map. If the present cable route is adopted and the cable increased to provide the necessary facilities, the plan is, at present, direct feed, but it would become back feed when the central office location is changed. Additions to existing feeder cable are already planned with a view of the probable change in location of the central office and therefore the alternate route if at all practicable should be selected as the distributing cable in this section will be direct feed no matter where the central office is located.

Of course a decision of this kind must be controlled by the actual conditions on the ground, and it was found that no physical obstacles existed that would prevent the use of the right of way. Negotiations are now under way to secure the rights and there is practically no doubt that they willl be secured.

Actual Determination of Cable Size.

Now that the route of the relief cable has been decided tentatively, the determination of the number of pairs to be placed may be taken up. The first step is to find out the number of pairs required at the present time. This is a simple matter, merely requiring a count of working lines in the section. In the map will be found certain figures in the form of fractions appearing in the corners of the blocks and at street intersections. These are the present and ultimate number of lines, the denominator representing the present and the numerator the ultimate number of lines.

Ultimate Number of Pairs.

The determination of the ultimate number of pairs required is not difficult but is done systematically. Any telephone manager or plant man should be competent to go to any block in his city and appraise the telephonic possibilities. He is familiar with the character of the people in the block, their needs for telephone service, and their ability to pay for it at present, and at any other rates that may be planned for the future. In the present case, the number of lines required ultimately were taken from the fundamental plan study. In the upper left hand corner of each block will be noted certain figures and letters. The figures represent an arbitrary classification of houses into classes which may be expressed roughly as follows:

A—Practically certain to take individual service.

B—Intermediate between individual and 4-party service, about 50% each.

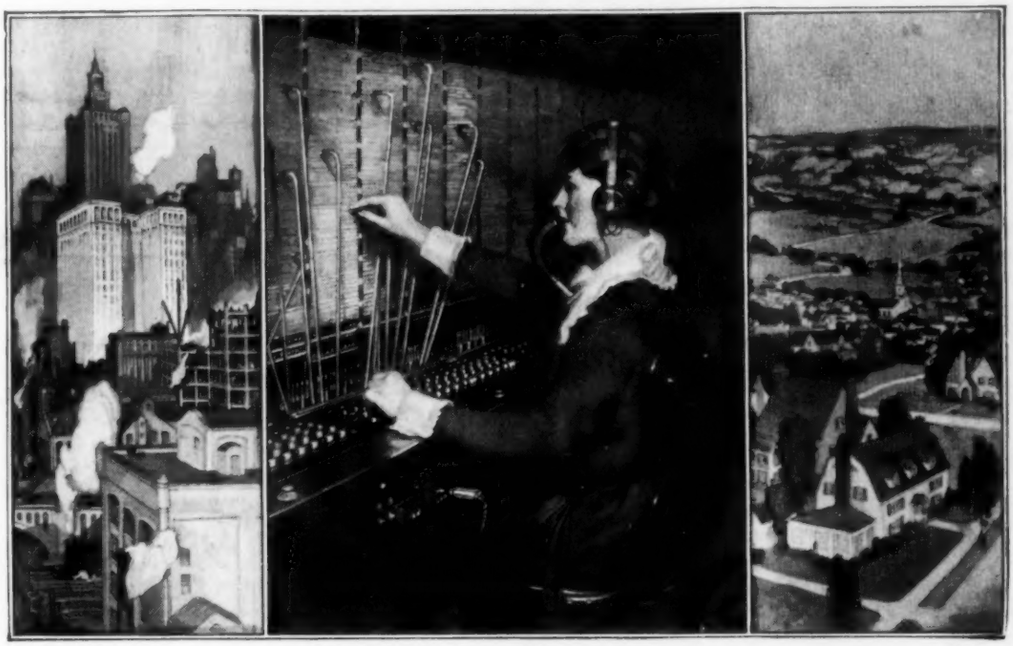
C—Practically certain to take 4-party service.

D—Not likely to have service of any kind.

E—Business house, individual service.

It is assumed that 4-party lines average 2½ subscribers to the line and therefore each class C subscriber will require .4 line. Each Class B will require .8 line and each Class A and Class E subscriber will require one line. No provision is made for class D houses but the flexibility of the cable plant will care for such service as may be required in exceptional cases.

Starting at the distant end of the territory, the number of lines may now be built up working toward the feeder cable



At your service

The courteous girl at the switchboard speaks the first word in more than two million conversations an hour. Presiding day and night at the busy intersections of speech, she is always at the call of the nation's homes, farms and offices.

Out of sight, and most of the time out of hearing of the subscribers, little is known of the switchboard girl—of her training and supervision under careful teachers, and of her swift and skilful work. Likewise, little is known of the engineering problems necessary to bring the terminals of fifteen million telephones within the reach of a girl's arm, or of the ceaseless work of maintenance which in fair weather and storm keeps the mechanism fit and the wires open.

America's millions of people must have at their command means of direct and instant communication, and the Bell System must ever be in tune with the demands of national service.

These are the components of America's system of telephony: The best of engineering, of manufacture, of facilities—and a personnel trained and eager to serve.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES
BELL SYSTEM
One Policy, One System, Universal Service

and adding the lines for each block at the point where they would enter the cable. The size of the cable builds up to 16 working pair and 26 pair ultimate at the point where the cable branches.

The Ultimate Distributing Cable.

In the ultimate plan a 50 pair cable is required for the first two blocks. From that point, 25 pair cable branching in three directions will be sufficiently large. The question arises whether it will be advisable to put up 50 pair cable when only 16 pair are needed at once and the ultimate estimated need is only 26 pair. In all probability a 25 pair cable at the present rate of growth as nearly as it can be determined will suffice for from 5 to 10 years. The difference in cost between the 25 pair and the 50 pair cable will practically be the difference in cost of the cable alone as the other material, pole work, suspension, terminals, etc., will be the same and the cost of splicing will not be much different. Quotations on 25 and 50 pair cable obtained a few weeks ago differed by 6 and a fraction cents per foot at the factory. The distance over which the 50 pair cable would be used is 710 feet. At 7 cents per foot the difference in cost is about $50.00 in first cost. This is the difference in the total estimate which amounted to about $1,000 or about 5%.

Knowing the costs of 25 and 50 pair cable and the annual charges it would be possible to figure out exactly the number of years that the 25 pair cable would have to serve and then be replaced with 50 pair cable to be more economical than a 50 pair cable placed at once. With most telephone men, this would be determined on the basis of good judgment rather than on figures derived from the suggested method. At this point the problem will be left to each one who may examine it to decide what he would do in a similar case.

Determination of Gauge of Wire.

In the present problem, the determination of gauge of wire did not enter as the extreme end of the cable was not more than 3,000 feet from either the present location of the central office or any site that might become the future location of the office. Existing feeder cables are 22 ga. but the distance would not require larger than No. 24 ga. conductors. Where distances from the central office permit, there is a growing tendency to use No. 24 ga. conductors. Some marked savings not only in cable but in conduit are made where a large number of pairs are required. In the smaller sizes the savings are not so great and there is not so much incentive to adopt the smaller gauge conductors on account of the smaller saving. Some companies, however, are using 24 ga. cable in 25 pair and 50 pair sizes and report good results.

Where the cable extends to greater distances from the office, the gauge of wire becomes more important. In common battery exchanges there are two types of transmission loss, current supply loss and high frequency loss. Current supply loss is the result of reduction in current through the transmitter as the resistance of the subscriber's loop is increased. This loss is naturally greater with 24 than with 22 ga. cable and greater with 22 ga. than with 19 ga. cable. Recent tendencies to extend cable into rural districts sometimes for several miles and to use common battery on farm lines makes the determination of gauge of wire in cable still more important. Space is not available for a complete discussion of the method of determining the gauge of wire to be used but it may be said that extreme care must be used to prevent great reduction of transmission efficiency by the use of too small gauge conductors or too great lengths of cable for the battery voltage employed.

Who Wants This $100 Reward for a Slogan?

Chicago, Ill.—As the largest manufacturer of blue printing machinery, The C. F. Pease Co, Chicago, is conducting a campaign to show thousands of users how they can operate their blue printing equipments more profitably. It is, also, this company's desire to increase the quality of blue prints used because they know that better blue prints will benefit the user as well as the industry. The C. F. Pease Company is seeking a slogan like "Use More Blue Prints!" and is offering a $100 prize for the best suggestion. It should be an easily remembered phrase—either based on an experience that could be duplicated by other users or so pat that it leaves no opening for argument. Write for particulars to The C. F. Pease Co., 813-821 N. Franklin St., Chicago.

"Outline of Automatic Telephony" New English Book

London, Eng.—William Aitken, author of the Standard three-volume "Automatic Telephone Systems," has prepared a concise manual under the title of "An Outline of Automatic Telephony," giving a survey of all the latest information on the workings of all important automatic telephone systems, and dealing with the fundamentals of all known systems, their apparatus and essential circuits. "An Outline of Automatic Telephony" will be published by Messrs. Ernest Bonn, of London, soon.

ALWAYS A BATTERY MAN.

Here's a solid citizen who was connected with the battery for sport long before he ever got into the battery business as labor. It's Frank Eldridge of the French Battery and Carbon Company, who, many state, enjoys the widest acquaintance of any salesman in the telephone business.

Frank's sturdy Hoosier physique put him into sandlot baseball as a youngster and graduated him into semi-pro baseball, thence to the Chi-

cago White Sox. He still retains some cunning in his good right arm, but long ago was divorced from a big league roster.

From his birthplace, Wolcott, Indiana, Eldridge wandered into Chicago and eventually made his debut in the telephone business in 1903 with the Chicago Telephone Company in the collection department. He went with the Illinois Tunnel Company as assistant to President Frisbee, and later with the A. T. and T., as special service inspector, in which connection he handled some man-sized jobs, among them the Republican national convention at Chicago.

Then followed work with the National Independent association and five years as special sales representative for Kellogg's. In 1919 Frank went with the French Battery and Carbon Company as general sales representative, and has been pitching a steady flow of orders across the home plate of the company at Madison ever since.

Anderson Test Set is Standarized

Abilene, Kan.—Many of the larger telephone companies, railroads and pipe lines are standardizing the Anderson Test Set, says Clarence A. Anderson, head of the West Mfg. Co., makers of the device. The Anderson set locates line troubles quickly with a finder coil and effects a decided recution in lost circuit expense. The equipment is getting a steadily growing volume of business as evidence of its value, its sponsors state.

LEICH MAGNETO MULTIPLE SWITCHBOARDS WITH LAMP SUPERVISION

The operating speed of the Leich Magneto Multiple Switchboard has always far exceeded that of any competing magneto switchboard.

The call distribution, due to full multiple and electrically restored drops, insures an operating speed much faster than a plug restoring drop board and one-way multiple.

Supervision with double electrically restored drops and pilots controlled by operator's key has been most satisfactory.

And now Leich Magneto Multiple Switchboard with double lamp supervision, flashing recall during signals, are offered at only a slight advance in price per cord circuit so equipped.

The electrically restored drop raised the Leich Magneto Multiple switchboard into a class of its own. The Double Lamp Supervision has made it more efficient.

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Lines From a Car Window

As a Monon Local Train Travels Through Indiana, an Observing Correspondent Jots Down His Impressions of the Telephone Lines He Sees, and Philosophizes a Little

By TRAVELER

If the writer of this were an Arthur Brisbane, at the head of the first paragraph would likely be found the caption, "On a Monon Train in Indiana." The Monon is a small road, but it has many fine trains between its three terminals, Chicago, Indianapolis and Louisville. Our train, however, is not one of the fine trains but is a leisurely local. No Pullmans, parlor cars or diners; just a small engine, a baggage and mail car, a smoker and a coach. Every station is a port of call for this train.

Occasionally when time does not press heavily we like to take the local trains, especially in Indiana. In spite of the industrial development in its cities, Indiana is still a farming state and the heart of Hoosierdom is in the small towns. The local trains are still an institution on the Monon, although they have almost disappeared on some of the better known and larger railroads and the small town population still turns out to see the train come in in spite of the fact that the goings away and the comings back are no longer exclusively done by rail.

Another reason for our liking for the local is that it gives us the opportunity to observe telephone conditions as far as they are reflected by the appearance of the part of the outside plant that can be seen from the train. It is to record some of these observations that is the real reason for writing this. We are passing through a prosperous farming section; prosperous in the past and doing fairly well in spite of unfavorable conditions generally on the farm. We may reasonably expect the telephone lines to reflect the conditions of the farming country, but they can scarcely be said to do so.

We are now coming into a fairly good sized country town; one with a population of a thousand or so. We know the man who is operating the telephone plant and are interested in seeing just what is being done. A few years back he took it over when it was in bad shape and the results of his work are becoming apparent. Some cable has been placed to replace an open wire lead. In another place we can see where rings have been put on to replace marlin hangers. The general appearance is much better than it was a few years ago. There is still much work to be done but the start has been made. Given a few years more and the plant will be in good repair. It has taken some money and a great deal more work but the additional investment is probably earning its return. In a few years we expect to see this plant take its place as one of the prosperous properties of the state.

A few miles farther and we are coming to another town. Along the railroad siding is part of a carload of new cedar poles and just as we are thinking of the careless way they are stored we get a glance at some of the lines. We have never heard of the telephone company in this place, which is a small one. Whether it is a mutual or a privately owned venture we can not say, but we are surprised by the character of its construction. It is light construction of course and we see no cable. The size of the place does not require many lines. As the train pulls out we pass some new work. A nice line of twenties with a six pin arm. Corners are well guyed. Slack is even. At the railroad crossing the line is graded up and the high poles on each side have double arms and are storm guyed. Spur lines indicate grounded service, but there are no power lines in sight, so we are sure that the service is pretty good as far as the quality can be indicated by the condition of the plant. Whoever may be the owner of this plant we can see that the work on it is done by a man who is willing and who takes pride in a well finished job.

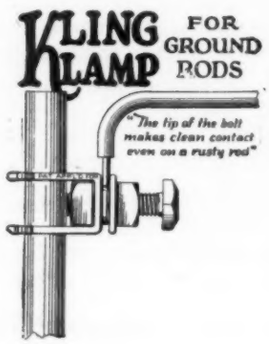
As we travel along, we are struck by the contrast when we pass from this plant into the territory of its neighbor. The first indication is at a railroad crossing where the telephone line crosses at an angle. The single wire jumps up from a twenty-foot stick to a slim thirty-five. In spite of the side pull, the thirty-five is not guyed and the wire is held by a single bracket. Such conditions make us sympathize with the railroads in their efforts to require safe construction at crossings. More of the construction is of similar character as we approach the town. The town itself is a fine country town. The main street is a wide thoroughfare paved with brick and lined with two or three blocks of prosperous looking business buildings. But the telephone plant shows a woeful lack of care. This is one of the conditions we can not understand. Here is a splendid town, well able and probably willing to pay for first class service and to support a first class plant. Something is lacking and our guess is that the missing element is good management.

A few miles farther, past a couple of stations with grain elevators and station buildings with boarded up windows—for the railroad has found it can not keep an agent at each station—and we come to another small town with a large name. The telephone office is near the station and we see a lead of about 30 wires on twenty-five foot poles with a short piece of cable into the building. At one place a branch lead of five wires breaks off across the highway. The span is at least 150 feet long and the buck arm pole is not guyed. All the wires sag several feet and we have a vision of many crosses every time the wind blows. What would happen if a half-inch of sleet came with a forty mile gale may be imagined. Here, evidently, is one of those small plants that is one of the real problems of the business today. Territory limited, plant deteriorated, revenue barely sufficient to pay current expenses, the plant is eking out an existence but it can not go on many more years. Some day this community will have to face the problem of how it is going to get telephone service for the present plant will no longer be able to supply it. Just how the problem will be solved can not be foretold.

It is now getting too dark to see much of the lines as the train moves on and the street lights of the small city which is the next station already begin to shine through the darkness. At the station a gang of workmen get on the train and leave again a couple of stations beyond. Railroad employes, for the conductor collects no tickets. Another twenty minutes with a couple of stops and we reach our destination. The smoker is nearly empty and we do not see a passenger in the coach. As we step off we say to the brakeman, "You have a pretty light load from here on." He replies, "The man who just got off and you were the only two paying passengers we have had on this run. The others were deadheads." We leave the station platform wondering just how far $5.20 in revenue traffic would go toward paying the wages of a five-man train crew, several tons of coal, wear and tear of equipment and the other expenses of a hundred mile run. Evidently other utilities than telephone have not yet solved the problem of making every portion of their service a paying proposition.

S-C Radio Broadcasts "Stand Pat" Radio Policy

Rochester, N. Y.—An important step in the direction of the stabilization of the radio market, too long flooded with frequently changed models and cheaply assembled sets, has been marked by the broadcasting of a night letter to all dealers and agents of the Stromberg-Carlson Company, assuring them that no change would be made either in prices or in models.



The Cupped Tip of the Galvanized Steel Bolt Cuts Deeply into the Clean Metal of the Rod.

Is a quicker, cheaper, better method than soldering.

For ½" Rod—15c each
For ⅝" Rod—18c each

QUANTITY DISCOUNTS
100 lots, 10% 1000 lots, 20%

Reliable Electric Company

3145 Carroll Avenue Chicago, Illinois

Plan District Meets

North Dakota Convention Puts Four District Sessions on State Program.

Valley City, N. D.—Four district conferences are to be held in North Dakota next summer as a result of plans laid at the annual convention of the North Dakota Telephone Association.

The annual meeting was one of the most successful in the state's history, and resulted in the re-election of the entire 1924 ticket, headed by President H. A. Brown.

North Dakota has been up against some legislative activities imperiling telephone interests and the details of the fight waged by the telephone men in successful self-defense supplied some of the convention program's high-lights.

Prior to the passing of the resolution to hold the district conferences, the subject was covered by L. D. Richardson of the Northwestern Bell, H. W. Wilson of New Rockford, Grant Harris of Page and Hill, and E. H. Morris of the Railroad commission.

"We must buck up, take the bit in our teeth and go after what we need," George W. Robinson, president of the Tri-State advised the North Dakotans, in speaking on the trend of the telephone industry. Mr. Robinson told of the progress made in bettering public relations, and counseled foresighted planning so the telephone companies could get material and capital when conditions are favorable. He also spoke on the work of the national association.

Importance of a proper depreciation reserve was stressed in the address made by H. A. Livermore, statistician of the Northwestern Bell. C. S. Kennedy, general manager of the Otter Tail Power Co., Fergus Falls, Minn., speaking on "High Line Interference," told of the problem becoming acute due to the extensive high tension distribution policies of electric companies. He recited the history of the efforts of telephone and electric light and power interests to co-ordinate their operations, and cited the service of his own company's telephone line, strung on the same poles that carried the power lines, as evidence that proper precautions would eliminate the usual disturbances.

Grant Harris of the Page and Hill Company spoke on cedar poles.

An interesting and well attended operators' conference was held during the convention. Miss Hazel Duncan of Fargo officiated as chairman of the traffic school.

Florida in Swift Rise

Sixteenth Convention of State Group Considers Growing Pains.

Lakeland, Fla.— Florida's recent rapid growth was reflected in the proceedings of the sixteenth annual convention of the Florida Telephone Association. The greater part of the convention was devoted to a consideration of the various growing pains that hit a telephone property in swiftly developing territory.

An indication of the pace of Florida's telephone growth was given in the address of President W. G. Brorein of the association, who recalled that when the association was formed in 1909, there were only about 500 telephones south of Jacksonville. Today the Peninsular company, of which Mr. Brorein is president and general manager, alone serves more than 35,000 telephones. J. S. Gillentine, chief engineer of the Intercounty Telephone Company, Fort Meyers, and A. B. Greene, engineer of the Florida Railroad commission, also spoke on the phenomenal increase in the state's telephone business, Mr. Greene forecasting that the population of the state would double by 1930, and the telephone development would increase from about 90 stations

ANDERSON'S TEST SET

LOCATES LINE TROUBLES QUICKLY WITH A FINDER COIL

You can make a judicious step toward economy by replacing your ordinary linemen's test sets with Anderson trouble finders immediately.

The savings can be measured in the reduction of lost circuit revenue, labor and car expense. In some cases the savings effected may more than repay for a test set the first time it is used.

The increasing demand for this reliable device attests its economical value.

Used and recommended by many of the foremost wire companies in the United States.

West Manufacturing Co., Abilene, Kans.

per 1,000, its present status, to about 170 stations per 1,000 population, in five years.

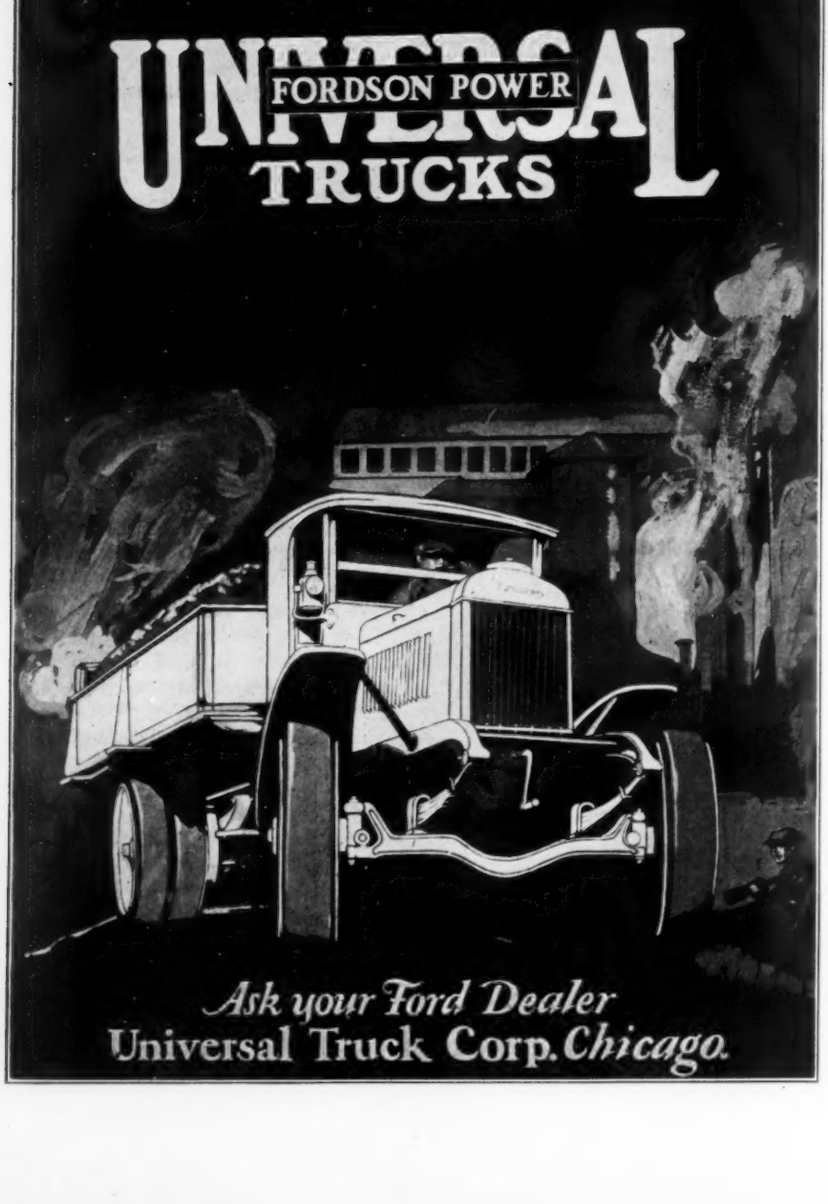
Rate problems were handled by Otto Wettstein and A. B. Steuart. John F. Vaughn, plant superintendent for the Peninsular, led the discussion on construction problems in rapidly-growing districts. Among the many problems of this character which were talked over was that of interference from high tension electric lines. This matter was referred to a legislative committee.

A committee on public education is to be appointed in the near future with the idea of protecting and increasing the harmonious public relations generally enjoyed by Florida telephone companies.

Several of the speakers, including Col. W. H. Adkins, R. H. Pope and Roy Owens, spoke in a reminiscent vein.

An interesting feature of the convention was the operating long distance installation made by the Automatic Electric Company, which was handling calls between Lakeland, Bartow and Tampa.

The officials of the 1924 roster were unanimously re-elected.



Oklahoma Breaks Record

Biggest Convention in State's Utility History; Boase Heads Telephone Men.

Oklahoma City, Okla.—Approximately 700 attended the seventh annual convention of the Oklahoma Utilities Association, exceeding by a good margin the best previous attendance record.

E. J. Boase, manager of the Frederick Telephone Company, was elected chairman of the telephone division of the association. L. E. Thrasher of Poteau, president of the Oklahoma-Arkansas Telephone Company was the telephone man elected to the executive board. On the newly created Public Relations division of the association, Harvey E. Rhodes, advertising manager of the Southwestern Bell Telephone Company was elected as representative of the telephone interests.

Due to the development of radio to the point where it was thought worthy of recognition as a public utility, there was consideration given to the formation of a radio division of the association but action was deferred.

Under the leadership of the retiring president, Jack Walton, the telephone division of the association held some spirited and practical sessions. Miss Anne Barnes conducted traffic confer-

ences which were well attended. Effects of the eight district conferences held during the year by the telephone division were apparent in the tenor of the telephone sessions which were concentrated upon the every-day problems confronting the state's telephone men and women. The telephone division showed the greatest gain in membership of any of the utility groups, having now attained a membership of 150 which includes all of the larger companies of the state and most of the small ones, including even a goodly number of the farmers' mutual enterprises.

An array of notables featured the program of the association's meeting. Among the nationally known utility leaders who spoke, and their subjects, were: W. S. Vivian, director of public relations, Middle West Utilities Company, spoke on "Public Relations"; E. Bently Hamilton, assistant general attorney, Missouri Power & Light Company, who talked on "Public Utility Regulation, Its Benefits and Abuses," and W. R. G. Baker, engineer, radio department, General Electric Company, who gave an address illustrated by lantern slides on the subject of "Interference by Electric Transmission and Telephone Lines with Radio Reception."

John C. Hall of St. Louis, Mo., attorney of the Missouri Association of Public Utilities, was the chief speaker at the annual banquet and entertainment.

Men who figured prominently in state utility matters also were conspicuous on the program.

March Illinois Meeting Is Well Attended

Paxton, Ill.—The March district convention of the Illinois Telephone Association, held here, was divided into two divisions, the executives' conference being held in the Circuit Court room while the traffic conference was held in the Council Chamber of the City Hall. F. A. Norris, Monmouth, President; A. R. Patterson, Streator, Vice-President; and Jay G. Mitchell, Springfield, Secretary-Treasurer, were present, and the traffic conference was in charge of Miss Esther Sorensen, traveling chief operator of the Illinois Telephone Association, assisted by the supervisors and chief operators of a number of the telephone companies in the district.

In the executives' conference a very lively discussion on pending legislation and the sleet storm relief order of the Illinois Commerce Commission occurred. In the traffic conference a fine program presented the following papers: Miss Amanda Abrahamson, chief operator, Paxton, Illinois, "A Small Exchange Operator"; Mrs. Bessie Gachet, chief operator, Chebanse, Illinois, "Public Relations"; Mrs. Margaret Wagle, chief operator, Danville, Illinois, "Team Work Between Toll Center and Tributary"; Mrs. Gertrude Alsip, chief operator, Champaign, Illinois, "Enunciation," besides a drill in enunciation given by Miss Catherine Sullivan, toll instructress of the Illinois Bell Telephone Company, Peoria.

The April meeting of the Illinois Telephone Association will be held at Milledgeville, Illinois, on April 15th.

Kerens, W. Va.—H. S. Irons heads the incorporators of the Cheat Valley Telephone Company.

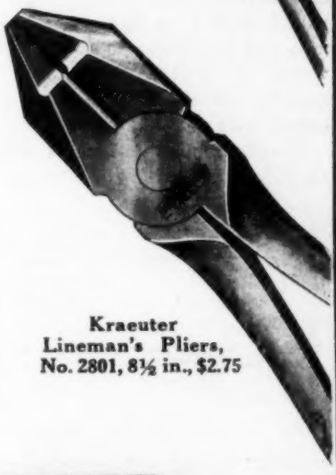
No Immediate Rates Probe by Interstate Commerce Commission

Washington, D. C.—The Interstate Commerce Commission on March 12th issued its Order No. 17000 instituting a general investigation of the rate structures of common carriers. In a statement to the public accompanying the order, the intention of the Commission is indicated to limit the present investigation to such common carriers as are employed in the transportation of persons and property. For the present, at least, the investigation will not be extended to telephone and telegraph companies.

KRAEUTER & CO.

Diagonal Cutting Pliers. No. 2601, 6 in. $1.65

Radio and Switchboard Pliers. No. 1561, 6½ in., $2.00



Kraeuter Lineman's Pliers, No. 2801, 8½ in., $2.75

EVERY pair of Kraeuter Pliers is hardened with extreme accuracy.

Their cutters are *hard* but not brittle.

Their rugged lap-joints *fit close*, and hold the cutters true.

Every pair is tested at the factory for *strength, toughness* and *cutting power.*

KRAEUTER PLIERS

KRAEUTER & CO., Newark, N. J., Established 1860

LINE AND DESK

ANOTHER CASE OF RADIO INTERFERENCE CLEARED

In working around our ringing converters, in an attempt to remove the cause for complaint by radio listeners, we were trying the usual remedial means, when it occurred to us that the trouble might not be with the vibrators but rather with the interrupters that provide the intermittent ringing on the automatic ringing cord circuits. We tried bridging a 2 mf. condenser around one contact and found that it reduced the trouble materially. When condensers were connected across the other three sets of contacts, the trouble disappeared. This went to prove, in our case at least, that the interference was caused by the making and breaking of the interrupter contact, in connecting and opening the ringing circuit at the beginning and end of the ringing period. The vibrators themselves seemed to cause no trouble.—Contributed by Sam. Tomlinson.

RIGHT AND WRONG WAYS OF MAKING SLEEVE JOINTS

In a very popular catalogue for telephone supplies, a description is given showing the standard method of making line joints by means of sleeves. This method of making sleeve joints in copper wire is used by a large number of linemen and trouble men, but it is entirely wrong and is the direct cause of the majority of breaks at sleeve joints in copper wire.

The description (which is wrong) is given in the sketches of Fig. 1.

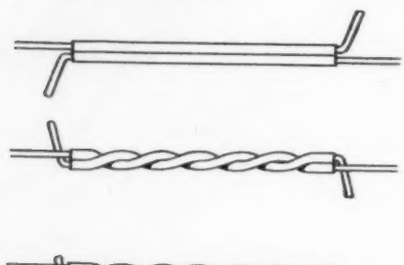


Fig. 1. The wrong way to make a sleeve joint.

Now if you will make up a sleeve joint in copper wire as shown above you will find that when the sleeve is twisted by the connectors the short ends which have been turned back at the end of sleeve brings a pressure on the line wire, eventually causing a bad bruise on the copper line wire. Later when a severe strain such as contraction caused by low temperature, etc., comes, the wire will break at this weakened point.

The correct method of making a sleeve joint in copper wire is as follows:

Have short ends lying parallel to line

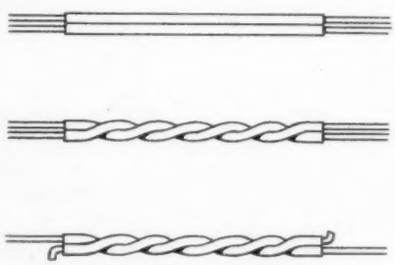


Fig. 2. The correct method.

wire. After twisting of sleeve is completed, turn the short ends away from the line wire and either twist off or cut off short ends, leaving ends pointing away from line wire as shown in Fig. 2. —Contributed.

HERE'S TO "THE FRAMEMAN"

The frameman, knight of the jumper, his lance a soldering iron, his battle-axe a pair of long-nosed pliers, his trusty steed the ladder in front of the frames, his job a ladder by which he may win his spurs and mount higher in plant service.

The frameman is the intermediary between the cableman or lineman and the operator—between the subscriber's line and the switchboard—for it is he who makes the connection between the subscriber's line, whether it enters the office underground or overhead, and the frames and thence to the "A" and "B" boards.

In common with other telephone folks, he feels the effect of the spring and fall moving rushes when he is called upon to "move" the subscriber from one connection on the frame to another. He meets his greatest emergency, and meets it well, at the time of cable failure when he constitutes a part of the shock troops which are called into action to tide over this difficult time. Then the affected lines temporarily must be routed over spare pairs in other cables and it is on the frames that this work is done.—"Bell Telephone News."

WHAT WAS SAVED IN THIS CASE?

Perhaps a moment was saved by omitting the proper tie at the end of the

Another hazard for linemen.

strand but a dangerous condition was created that is a hazard every time a lineman has to climb this pole.

UPS AND DOWNS OF A REPAIRMAN

During my nine years of service I have been almost everything from janitor to foreman, but most of my time has been spent on local and toll trouble. One rainy evening the wire chief gave me a case of trouble to clear. The line had a "ground" on the "ring side," and the rain had been pouring down all day. When I knocked on the door of the subscriber's residence, the door was opened by a woman. I informed her of my business, but she stated that the telephone was not out of order and banged the door. I then went to the pole at the rear of the house and found that the "ground" was toward the office, so I started for the crossbox.

In the meantime, the woman in the house had grown suspicious and called the commercial office to inquire if a man of my description had been sent to her house. They replied in the negative and advised her to call the police. She did. For some months I had quite a time explaining this to the complete satisfaction of all who heard of it, which seemed to include everybody.

But speaking of bad weather and

women subscribers, one cold winter day, probably ten below zero, a woman reported a wire down three or more miles in the country. I hit the chilly breeze mounted on a motorcycle and finally reached the address, almost frozen but otherwise in good condition. The woman pointed to the wire, which I inspected very carefully and found in good condition. I then started back for town on the return trip of the coldest ride I ever enjoyed or attempted to enjoy. I have often thought of this trip and have definitely decided that one of two things is certain; either the woman who reported the wire down had a grudge against us, or else she was thinking about going to town and wanted to find out if it would be safe for a human to attempt to make the trip while the weather was so cold.

My first experience in finding carbon loose in a transmitter happened to be in the prosecuting attorney's office, and because of this I pulled a boner that is yet to be forgotten. I informed the worthy prosecutor that somebody was trying to blow up his office and brought the powder into the storeroom for analysis. I was promptly informed that the powder was transmitter carbon and was not explosive. A case of this kind will probably not happen again, as this one was well advertised.

One day recently when I called on a subscriber to clear trouble on his business telephone, he came out from behind his desk to shake hands with me. I was somewhat surprised at this, but was soon relieved. All he wanted was somebody to tell him a few things about his radio and he had called a telephone man.—A. J. Breazeale, in *Southwestern Bell.*

To the left, the Ford life saver at work; at the right, the installation of the heated preservative tank.

FIGURE THIS ONE OUT FOR YOURSELF

One of the linemen in my gang occasionally shows his Irish ancestry in some of the things he says. The other day while transferring wires from an old pole line to a new, he tested a pole as all careful linemen do before climbing and finding it unsafe he said to me, "We will have to storm-guy the poles in this line before we can climb them." Contributed by Bob Ewbank.

CREOSOTING STANDING POLES.

Following a recent article in TELEPHONE ENGINEER by P. J. Howe, Construction Engineer of the Western Union Telegraph Co., describing how that company is applying preservatives to standing poles, our attention was called to an article in "Long Lines," organ of the American Tel. & Tel. Co., Long Lines Division, describing the equipment used

Portable outfit for creosoting standing poles.

by that company. The original story was told in verse by P. G. Fitzpatrick ("an engineer mind you"), and we reproduce it herewith in its original form:

Our Creosoting Flivver.

Away back yonder beyond today
When the War stopped going and lost its sway,
Some one found, in the regular way
That our poles were subject to chronic decay.

"The War has stopped; the decay must too,"
Said the boss of ten to a group of two.
We had the oil and we had the crew
But everything else just had to be new.

So we rescued a Ford that was sick of the War,
Just to give it a chance to add to its score;
A tank was installed in the rear, on the floor,
And a heater beneath from the rear to the door.

The oil tank was cold, so we added a pipe
From the motor in front to the tank on the right;
The pipe on the left leads back to the pump,
Which keeps the hot water right on the jump.

"Red Devil" No. 495C, sizes 6, 7 and 8 inches. Sold by all dealers who have the interest of your safety at heart

Built-In Safety

"RED Devil" Pliers have stood the test for over a quarter century. Built to the highest ideals of safety for men's lives, they have won world-wide reputation and respect among linemen themselves.

"Red Devil" Insulated Extra Heavy Side Cutting Plier, tested to stand 10,000 volts, will fill the most exacting requirements demanded by electrical companies for a perfect insulation and a perfect plier. Finest quality steel, specially tempered.

Send for "Red Devil" Electrician's Tool Booklet—free on request

Smith & Hemenway Co., Inc.

Manufacturers of "Red Devil" Tools

263 Broadway - NEW YORK, N. Y.

Ask about our new "Red Devil" Torch for Electricians

TRADE MARK Red Devil Tools — Red Devil THE WORLD'S STANDARD — Better Made

The heater was helped in the selfsame way
By the gas from the motor which is burned away;
This is controlled by a valve in the car,
So the oil in the heater will not turn to tar.

An air pump was placed just under the hood
To push out the oil from the tank to the wood.
This finished the job and we thought it was good,
So we gave it a chance to do what it could.

We arrived on the job and turned on the heater,
Then pumped up some air and pulled out the leader,
In a minute and fifty the pole had been treated;
The oil line gauge to one-sixty was heated.

A hundred poles was the score that day
While the bugs and the ants took the right-of-way;
The poles felt better, and showed it too,
Because War had stopped and decay had too.

But that was only the start of our war
To keep standing poles from decaying too far;
Four more Fords have been trained to help chase
The bugs and ants from their resting place.

This little fleet with its gallant crew
Has been hitting the pole lines strong and true;
And fifty thousand poles feel like new,
As the result of a visit from one of the few.

They're still going strong and the last I heard
Was a comment passed by a farmer's bird:
"The squeal in the Ford has been harnessed," he said,
"And telephone poles are no longer found dead."

Peninsular Growth Reflects Big Florida Boom

Tampa, Fla.—Telephone service in Tampa will be broadened this year with the addition of equipment to cost $150,000, which will be installed in the five exchanges in the city. This expenditure will be in addition to approximately $125,000 which will be spent for a new wing in the main office of the company, as well as $50,000 in equipment for the new wing.

Other extension plans of the company call for the erection of buildings at Bradenton and Lakeland. Each of these buildings will cost in the neighborhood of $400,000, it was said. Equipment to cost around $250,000 will be installed in each plant.

Extensive improvements at St. Petersburg, to cost approximately $400,000, also are planned by the company. It has been tentatively decided to erect another building in St. Petersburg.

Plymouth, Ind.—The Winona Telephone Co. has received permission from the state commission to issue $25,000 preferred stock, the proceeds of which are to be used for additions to the system. The statement of the commission shows that $10,000 of new stock was sold by the company between 1920-24, and $25,800 was redeemed during that period. Outstanding common stock to the amount of $92,600 is shown and $180,000 in preferred stock. Assets of $351,073 are listed.

INTERFERENCE ELIMINATOR WORKS

In reference to article by P. H. Jones, we had similar trouble from interference with radio sets by our ringing interrupter. We installed the interference eliminator made by the manufacturer of our ringing machine and this does away with all the trouble. Contributed by J. E. Newitt.

Truth and not tradition determines battery values best

Telephone men are wise buyers of batteries—so wise, in fact, that they are getting right down to bedrock on the reasons for battery service. Their findings are bringing them to a rapidly spreading standardization of Victor Telephone batteries.

Just take three of the construction features of the Victor battery and you'll see why the business is coming our way:

The density of the compound in Victor batteries is greatest by weight—a positive assurance of longer life.

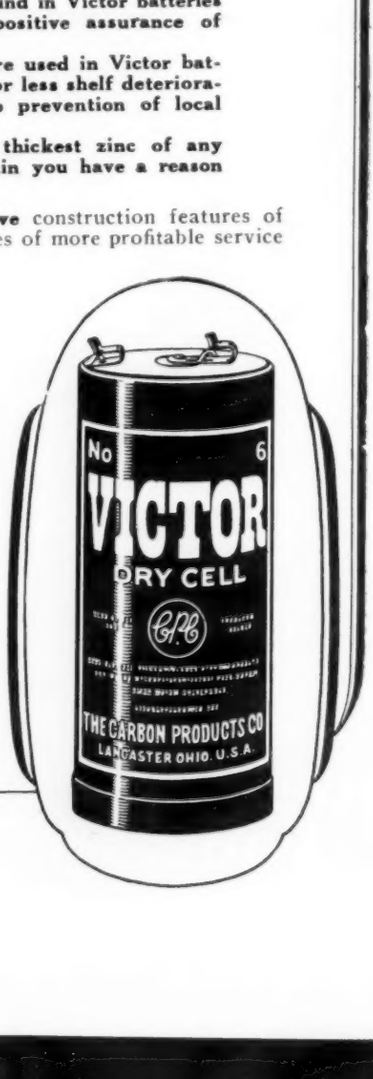
Special paste and liners are used in Victor batteries. Here is the reason for less shelf deterioration and longer life due to prevention of local action in the shell.

Victor batteries use the thickest zinc of any telephone dry battery. Again you have a reason for longer life.

There are a number of **exclusive** construction features of Victor batteries that are guarantees of more profitable service in telephone work. No amount of "high-powered" sales talk can get around the plain, unvarnished statement of Victor Construction reasons for superiority.

You owe it to your ledger and to your service standards to look into this battery matter thoroughly.

Write us for the name of your nearest Victor Distributor who will tell you how Victors are made, and then let your own good judgment decide about buying.



THE CARBON PRODUCTS CO.
LANCASTER, OHIO

Trunk Group Requirements

Accurate Determination of Sizes of Trunk Groups Is Necessary for Economical Operation and Satisfactory Service—Curves Are Given Here for Both Large and Small Offices

By F. J. DOMMERQUE,
Fellow, A. I. E. E.

To introduce the subject of trunk line requirements a map is presented in Fig. 1, which shows an agricultural telephone district about 75 miles long and 30 miles wide. This district is passing through a transformation into a plant embodying all the features of recent innovations and inventions. The map shows the ultimate goal to be reached. The district is in a foreign country, wherefore the names of towns and villages are omitted as immaterial. It hardly needs to be mentioned that ultimately this entire district will be operated automatically, that is for local business. For long distance business the operator is to remain the connecting link.

The large circles with a dot in the center represent main offices equipped to handle local, toll and long distance calls. The small circles are branch offices. They are equipped for handling local and short-haul toll business, their long distance business and that of the suboffices connected to them is sent to the nearest main office. The black dots are suboffices, which are entirely controlled from the nearest main or branch office, through which they send their entire business, with the possible exception of their local calls which are switched locally by companion work switches where local traffic warrants it. The reader is referred to the article on "Small Automatic Exchanges" in the TELEPHONE ENGINEER of October, 1923, for an example of the three kinds of offices. In the diagram accompanying that article Huglfing is an example of a suboffice, Weilheim an example of a branch office and Munich, not shown on the diagram but indicated by the toll line starting for it, is an example of a main office.

All the lines on the map (Fig. 1) represent trunk line channels.

The main offices are connected together and to the through long distance lines by direct trunks not shown in the drawing.

The branch offices in this district are few in number and the majority of the suboffices are connected directly to the main offices. This would not be as in a very large city, where nearly all suboffices would connect with branch offices. The suboffices are small exchanges containing one or more 50-line automatic units. They have no attendance whatever and are entirely controlled, supervised and maintained from the nearest

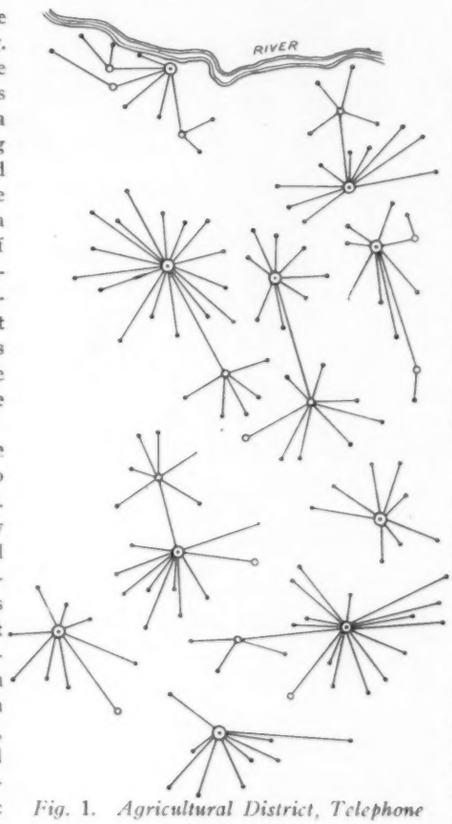


Fig. 1. Agricultural District, Telephone Development.

main or branch office. They are equipped with line switches and connectors. Where the local traffic is heavy they have also companion work switches to switch a local call directly to the local subscriber. In case of light local traffic, local calls are sent to the nearest main or branch office and back again, thereby swelling the number of outgoing and incoming trunks between suboffice and main or branch office. The latter are provided with first and second group-switches for trucking these suboffice calls.

On this map there are more suboffices than one would expect, but in the country where this district is located there are only very few large farms, the peasants have only a few acres of land each and live in small villages, from which their land is easily reached. These villages are consequently plentiful.

After this illustrative demonstration how the small exchanges are becoming involved in the trunk line problem the subject proper of this discussion will be taken up, namely, the determination of the number of trunk lines required to carry the traffic.

There are incoming and outgoing trunk lines, but the outgoing trunk lines are of interest only as they have to carry the originating calls to the various offices of the system. The originating calls and in particular the outgoing trunk calls have been determined in manual exchanges by a so-called segment and have been used for many years to calculate the trunk lines required, by means of formulas which had been empirical and which expressed the number of trunk lines (outgoing) as a fraction of the number of

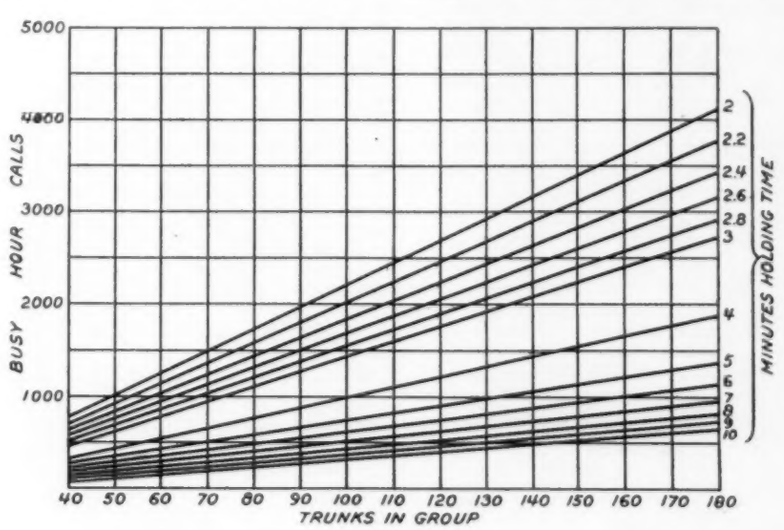


Fig. 2-A

outgoing trunk calls in the busy hour and the average direction of a trunk connection. Later when automatic operation was adopted, the same formulae were used, but as automatic trunking became such an important factor, the engineers interested in the problem began to revert to mathematics. In this problem the degree of efficiency—that is, the character of service—is expressed by the success or failure of an outgoing call to find an idle trunk line. It is possible to calculate by the theory of probabilities what the chances are for a call to find an idle trunk. It is not intended to enter into a discussion of these determinations nor of the empirical formulae, instead a set of curves is given, which have been platted by the writer from all available data and formulas as found here and abroad; these curves represent the mean values of all investigations and steer a middle course, giving the requirement on trunk lines not too ample nor scanty in any way.

The curves are platted in three parts—Fig. 2-A, B and C. The horizontal and vertical scale in Fig. 2-A is larger than the scale used in Fig. 2-B and the scale in Fig. 2-B again larger than the one in Fig. 3-C in order to facilitate reading of the values. The horizontal scale on the bottom of each of the three diagrams represents the number of trunks required to accommodate the busy home calls in the vertical scale to the left of each sheet. The figures annotated to each curve on the right hand side designate the holding time of the particular trunk in minutes. This holding time varies from 2 to 10 minutes; the 2 minutes is intended for calls in all-business districts; the 3 minutes for calls in all-residence districts and the intermediate values are to be used according to the proportion of business and residence subscribers in the district in which the originating office is located. Above 3 minutes the curves are intended for toll switching trunks and curve R for recording trunks, the curves always giving the trunks in a group. The busy-hour calls in the curves for toll switching trunks are "completed" busy-hour calls and in the curve R giving the number of recording trunks for particular person traffic; to obtain the number of trunks for two-number traffic the number of recording trunks given by curve R must be divided by two, that is, only half as many trunks are required for two-number traffic as for particular person traffic to carry the same number of calls.

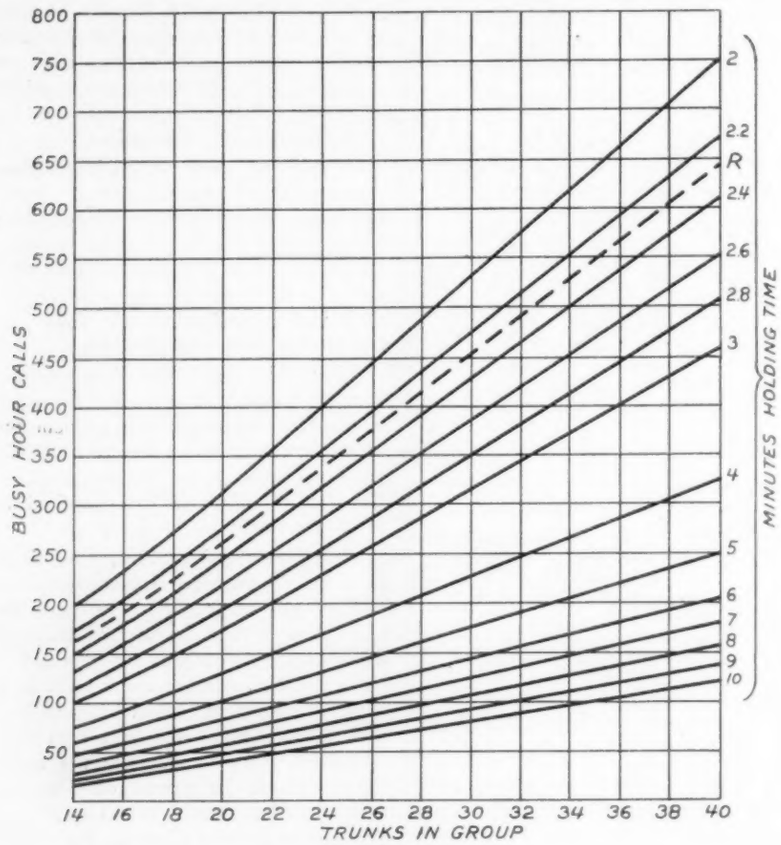


Fig. 2-B

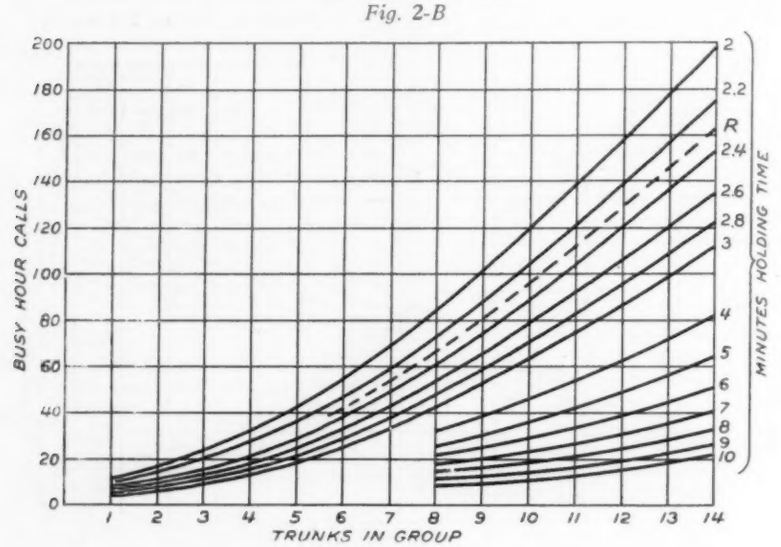


Fig. 2-C

Handyman Tools Get Big Spring Play

Bloomfield, Ind.—With the advent of the spring construction period the Harrah Mfg. Co. is experiencing a record business in Handyman pole pullers, pole pushers, and guy stretchers. The devices have been given strong endorsement by many of the leading telephone companies, and bring decided benefits to construction work.

The Handyman pole puller is a light and sturdy device that is easily attached to the pole, and pulls the pole out of the ground 3 feet without stopping to take a new hitch. It puts a tremendous leverage on a direct pull on the pole. The pole pusher consists of a Handyman jack mounted on a 48-inch standard, an eight-foot steel pike pole which telescopes the standard, and one steel I beam base, 24 inches long, which furnishes the foundation for the outfit. The pusher pushes the pole back into alignment and serves as a brace until the straightened pole is tamped and secured.

The Handyman guy stretcher eliminates block and tackle. It gives one man a pull of four feet on guy or messenger and allows placing of clamps without losing any slack in the wire. The tool also is valuable when pulling underground cable or in taking up slack when a splice is made. Only one man is necessary for the operation of the Handyman guy stretcher.

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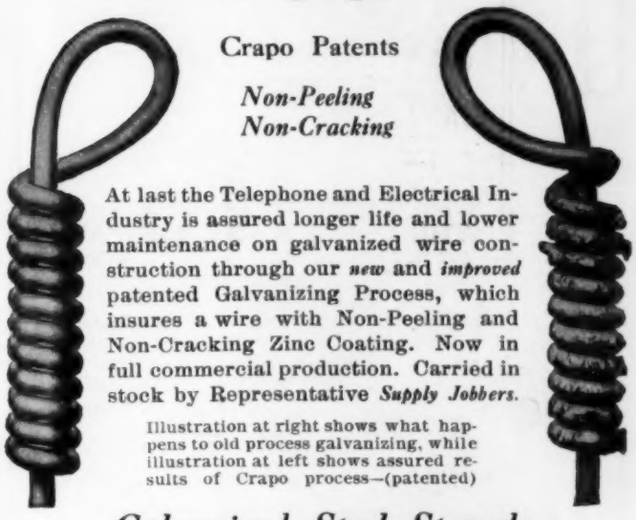

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Illustration at right shows what happens to old process galvanizing, while illustration at left shows assured results of Crapo process—(patented)

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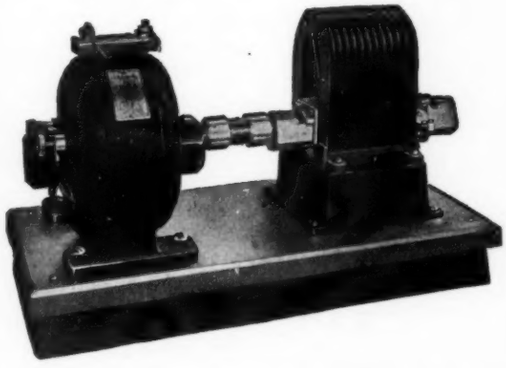

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Think of the winning slogan—something like "Use More Blue Prints," accompany same with your explanatory letter and get $100.00 for your idea.

Non-winners that can be used will be paid for at the rate of five dollars each.

Address Chairman Blue Print Slogan Committee, at the address given below for complete printed conditions of the contest.

This contest closes June 15, 1925.

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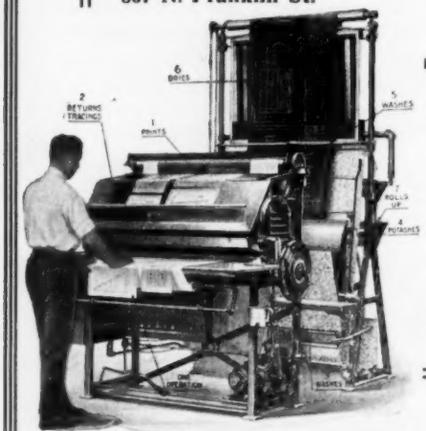

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Ohio Bell Is Booming

Will Spend $16,000,000 This Year; $71,000,000 In Five Years.

Ohio, Cleveland—Ohio Bell Telephone Co. is spending $15,980,000 this year for additions and betterments to plant and equipment throughout its territory, and the company's program for the next five years will necessitate an expenditure of $71,000,000. Expenditure of 1924 was $12,321,380. Randolph Eide, general manager and vice-president, says the 5-year program is one of the largest, if not the largest, ever undertaken by an Ohio utility. This $71,000,000 will be spread over the company's entire territory. It is expected that 25,000 new subscribers will be added this year, and 135,000 in the next five years.

The annual report points out that the company has completed unification in all cities where formerly were two companies, except at Columbus, where unification will be completed in 1925. Cities unified last year included Cleveland, Akron, Toledo and Youngstown.

Taxes amounting to $4.43 for every one of the 511,496 Ohio Bell telephones were paid last year, or a total of $2,219,515. Out of each dollar of revenue, nearly 8⅓ cents went for taxes.

In 1924 the Ohio Bell had 11,437 employees, 201 central offices, and 17,830 miles of pole line, carrying 1,765,512 miles of wire.

The directors have re-elected C. P. Cooper, president; John Uprichard, vice-president and general auditor, and C. L. McNaughton, secretary and treasurer. Randolph Eide, general manager, also was elected a vice-president.

A preferred stock dividend was declared of $1.75 a share for the quarter, payable April 1.

FOR SALE

Magneto exchange, all new. Good rates. Located in new, fast growing railroad town. Bell connection. No opposition. Good proposition, $6,000. Address: J. C. T., care TELEPHONE ENGINEER, 28 E. Jackson Blvd., Chicago.

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No. 105 Western Electric Magneto Type, Line drops No. 19A-100 line capacity—20 lines equipped—10 cord pairs equipped—11 ft. swbd. 20 line cable—20 line wall type main frame equipped for 20 outside lines and 20 swbd. side with carbons, heat coils and fuses. Price $100 F.O.B. Hamilton, Montana. Address E. G. Butterfield, Hamilton, Montana.

East Liverpool, O.—"Our fiftieth year," a booklet commemorating a half-century of the existence of R. Thomas & Sons Co., makers of electrical porcelain, has been published by the Thomas organization. Copy of the interesting publication will be sent on request.

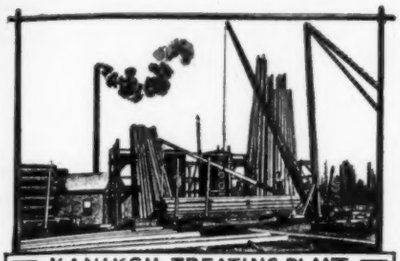
Crocker, Mo.—Perry D. Ward of St. Louis has purchased the Ozarks Telephone Company and will restore service. Crocker has been without telephone service since the December 17 sleet storm.

Charlestown, S. C.—Seacoast Telephone Co. has been incorporated by J. S. Mixon and others to operate the lines now on Wadmalaw and John's islands, originally owned by the Southern Bell.

Sweetser, Ind.—The Sweetser Rural Telephone Co., O. S. Keim, manager, is in the market for from 75 to 100 miles of No. 12 BB wire.

Bear Lake, Mich.—Efforts are being made to establish a telephone system in this city.

Thrall, Tex.—Frank Moody has purchased the Thrall Telephone Co.



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Edition New of Standard Telephone Book

The American Technical Society, publisher of "Telephony," by McMeen and Miller, which has for years been a standard work on telephone practice, has announced that the latest edition of the work includes a number of revisions and additions.

The book was out of print during the war but a second edition was prepared and printed in 1922, at which time a review appeared in these columns. The demand was so great that another edition became necessary. In the preparation of the new edition it was possible to include some valuable new material on machine switching. With the revisions and the new material, the book continues to be the most comprehensive treatise that is now in print.

Atlanta, Ga.—More than $2,300,000 was spent for additions to the plant of the Southern Bell in Georgia during 1924. In 1925 Southern Bell work in Georgia will call for an expenditure of approximately $2,302,400.

St. Louis, Mo.—Annual election of officers of the Matthews Corp. line material and electrical specialty makers named W. N. Matthews, president; Claude L. Matthews, vice president and treasurer; James R. Kearney, vice president and manager of electrical sales, and M. C. Cooley, secretary.

Mankato, Minn.—Leading story in and amount of space in the March 10 Mankato Free Press, the leading local newspaper, was devoted to the twenty-seventh anniversary of the Citizens' Telephone Co. Details of the stockholders' meeting, which authorized large increase in capital stock, and the annual financial statement of the company were featured.

Walcott, Iowa.—Fred Dietz heads the Walcott Mutual Telephone Co. which has been recently incorporated with a capital of $6,000.

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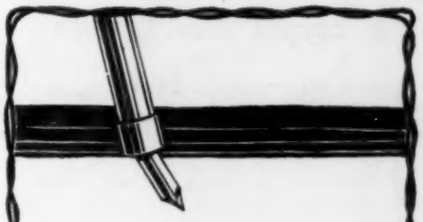

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Buckeyes' Best Confab

Ohio's Convention Has Big Attendance and Great Program.

Columbus, O.—Ohio's 1925 annual convention was unquestionably the best in the annals of the Ohio Independent Telephone Association with 700 telephone men from all parts of the state and a program that delved deep into the practical problems of the conventioneers.

Endorsement of the administration headed by Frank A. Knapp of Bellevue was registered in the re-election of the last year's officers, changed only in the election to the directorate of A. J. Berry of Marion, succeeding W. A. Norton.

The presidential address touched upon the safeguarding of the stockholders of the Ohio Independent companies furnishing service to more than 350,000 subscribers, by allowance of a proper rate.

President Knapp stated that the utilities are giving customers more for the money than other lines of business in the state and called for a public recognition of this fact. He cited the efforts of the association in fighting unfavorable legislation successfully and outlined the practical service given by the association to its member companies. High tribute was paid to the work of the association's secretary, Frank McKinney. Results of the district meetings also were among the subjects covered in the Knapp address.

A strong recommendation for Ohio companies to train their promising employees along executive lines so they will have a command of the telephone business in its entirety was made by President Knapp.

Secretary McKinney told of the successful fight waged against dangerous legislation and of the excellent financial position of the association, in his annual address.

Independent telephony now is in better shape than ever before according to President F. B. MacKinnon of the national association, who cited the statements of the Lincoln T. and T., Dakota Central, and Tri-State in support of his remark. Rural exchange management is the only independent telephone problem for which a solution has not been found, according to Mr. MacKinnon. A notable address on "The Development of the Telephone Industry and its Attendant Legislation" was made by A. J. Hess of the Sydney Telephone Company.

A protest against utilities being compelled to go to the courts to obtain justice in tax cases was registered by State Tax Commissioner John A. Cassiday, who, with S. A. Blessing, a state representative speaking on "Utilities Legislation of 1925," gave practical addresses showing the contact between the leaders in Ohio legislative thought, and the telephone men.

What the last 14 years have taught about the hazards of telephone operation and the protection of stockholders from losses was told to the convention by Lynton T. Block, head of the Utilities Indemnity Exchange, which for 14 years has been working with telephone com-

THEODORE GARY AND COMPANY
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Sixty-Seventh Consecutive Quarterly Dividend

The regular quarterly dividend of $3.00 a share on the Common Stock; $1.50 a share on the Class "A" and Class "D" Preferred Stock, together with a dividend of $2.00 a share on the Class "C" Preferred Stock, has this day been declared payable April 1, 1925, to the stockholders of record as of the thirty-first day of March, 1925, at 3 p. m. The books will be closed to transfer on March 25, 1925, and reopened on April 1, 1925.

(Signed) H. L. GARY,
First Vice-President and Treasurer.

March 10, 1925.

Whatever Your Question

Be it the pronunciation of **vitamin** or **marquisette** or **soviet**, the spelling of a puzzling word—the meaning of **overhead, novocaine**, etc., this "Supreme Authority"

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Western Elec. Co., No. 1317 compacts, 2- or 3-bar type with 2500-ohm ringers @	8.00
Dean Elec. Co., Straight line C. B. Steel hotel sets @	5.25
Kellogg No. 30 Straight line C. B. Biz. wall sets @	3.75
Dean C. B. Straight line desk sets with steel bell box @	6.50
Monarch 3-bar, 1000-ohm Bdg. desk sets @	8.50
Kellogg 3-bar, 1000-ohm Bdg. desk sets @	10.00
Stromberg 3-bar 1000- or 2500-ohm Bdg. desk sets @	10.00
Kellogg Local or C. B. Transmitters complete @	1.15
Kellogg No. 26A Receivers complete with cord @	1.25
Western Elec. No. 22 3-bar Bdg. hand Gen. complete @	1.50
Am. Elec. Co., Pony type 3-bar Bdg. and Gen., complete @	1.25
Western Elec. Co., 2500-ohm ringers, complete with gongs, @	1.25
Am. Elec. Co., 1600-ohm Non self-contained ringers @	1.00
Garford Pony Type 4-bar, 1600-ohm Bdg. compacts, @	8.50
Kellogg, Garford, or Stromberg 1-M. F. Condensers @	.35

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E. C. Stoeffhaas, Mgr.
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We are not connected with or successors to Rebuilt Telephone Equipment Co.

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Due to the rehabilitation of our entire exchange preparatory for the change from manual to automatic, we have to offer at present, the following:

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Ringer Sets, etc.

Some time in June the entire manual equipment of a Stromberg-Carlson Super-Service Switchboard and Toll Board will be released for sale. If interested, we would be glad to hear from you.

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Fort Wayne, Ind.

WANTED

Assistant Wire Chief for our Franklin (Pa.) exchange. New Stromberg-Carlson feature equipment. New building; over 3,000 stations; no competition. Good, steady position for man with experience and thoroughly competent on switchboard maintenance and relay adjustments. Reply, giving age, experience and reference. Salary will be $125 to $150 per month to start with, according to ability of man selected. Petroleum Telephone Co., Oil City, Pa.

FOR SALE

Magneto exchange, grounded system, 110 subscribers, no competition. Priced to sell. Address W. L. Punches, Walton, Kans.

panies on insurance matters. One of the recent developments of this service is an employees' benefit plan for Independent companies similar to the one in use by the Bell company.

There will appear in the May ENGINEER a splendid public relations address, "The People We Serve," which was delivered by W. J. O'Hea, assistant to the president of the Rochester, N. Y., Telephone Company.

From the viewpoint of a practical operating man, rather than that of an accountant, Frank Binkley, general manager of the United Telephone Company, Bellefontaine, summarized his talk on "Can Rural Service Be Made to Carry Its Cost," by stating that rural service at $1.50 is not carrying its rental expense. He doubted if $2 a month would carry rural telephones. It is necessary to either cut down the character of the service by placing more on party lines, or increasing the rate.

J. C. Boush laid down a good publicity platform for telephone companies in his paper on "Publicity; How It Is Obtained and What It Does for an Independent Telephone Company."

The program brought to light a number of other intensely practical addresses, among them being "Remaking a Small Company," by J. Warren Safford, general manager at Troy, "Eliminating Telephone Interference with Radio" by Sam Krauss, general manager of the Stillwater T. and T. Company, Covington, "Bringing Back the Subscribers Who Discontinue," by E. B. Morgan, Eaton Telephone Company, and "Better Plant Methods Spell Better Service," by C. W. Kugleman of Portsmouth.

Jos. Hickson of Mount Gilead described a hollow concrete pole of his invention, and other well known national and state figures spoke on the every-day problems confronting the telephone man.

A well attended traffic conference, steered by R. F. Pagels, traffic manager of the Warren and Niles Telephone Company was conducted during the meeting.

Tri-State (Uniontown, Pa.) Company Changes Hands

Uniontown, Pa.—John M. Core and Judge R. E. Umbel, stockholders and creditors of the Tri-State Telephone Co., have bought the company at auction for $5,000, subject to $50,000 with interest from December 1, 1923.

San Francisco, Cal.—Actual photographs of President Coolidge's inauguration, sent via wire by the American T. & T. Co., for the first time enabled Pacific Coast newspaper readers to see pictures of a presidential inauguration before nightfall of inaugural day.

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Kellogg 3 and 4 bar A. C. .....$3.00 and $3.50
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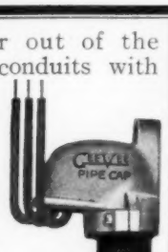

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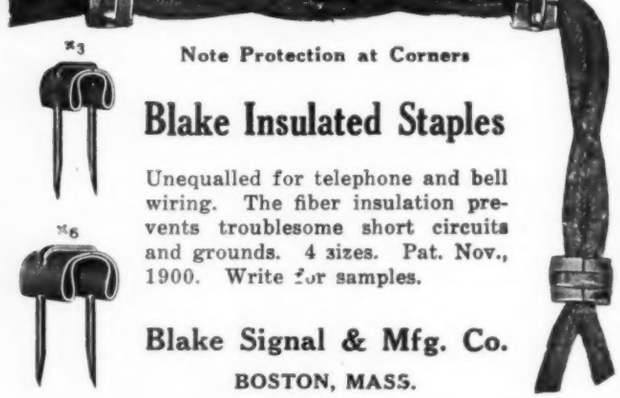

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